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THE OBJECTS OF THIS ASSOCIATION ARE:

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"To encourage in any practicable ways research work on chemical processes and materials of importance to the Textile Industry.

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AMERICAN
DYESTUFF REPORTER

VOLUME 25 OCTOBER 5, 1936 NUMBER 20

The Stretching of Acetate Rayon

As a Means for Improving its Properties

A. J. HALL, B.Sc., F.I.C., F.T.I.

THE writer has been interested in the effect of stretching on rayons of all types since some ten years ago when he discovered the beneficial effect which stretching had in increasing the resistance of acetate rayon towards delustering as produced by treatment with boiling aqueous liquors, especially soap liquors. At that time numerous defects in the rayon then available could be traced to the results of unequal stretching in the course of its manufacture, and most dyers and finishers will remember the difficulty then experienced in dyeing rayon fabrics uniformly and of finishing them free from unequal luster effects. Most of these difficulties are only seldom met with today, mainly because the tension on freshly spun rayon at the time of its manufacture is now more carefully controlled. The susceptibility of rayon to modification in its properties by stretching was in those days naturally looked upon as one of its defects, but it is otherwise today. Reference to the patent and scientific literature devoted to textiles will reveal the ever-increasing use which is being made of stretching as a force by which rayon, especially acetate rayon, can be improved. No longer is the susceptibility of rayon to stretching looked upon as a disadvantage; it is rather to be regarded as an advantage not to be found in other fibers such as cotton and linen, even viscose rayon.

Stretching can have an influence on the properties of rayon from the time at which it is freshly spun. The draft during spinning, that is, the stretch applied to the freshly formed filament as it is extruded from the spinning nozzle into the coagulating liquor (in wet spinning) or a current of warm air (in dry spinning) determines the tensile strength, the dyeing properties, and the luster of the resulting rayon. Generally, the higher the degree of draft the higher is the luster and strength, and the lower the affinity of the rayon for dyes. But this is only a generalization which must take into consideration special circumstances which pertain at the time of spinning.

It is not, however, the purpose of this article to deal with the stretching of rayon during its manufacture but rather to indicate how fully formed acetate rayon can be favorably influenced by stretching. In most instances this stretching is employed for the purpose of improving the tensile strength of the rayon but it will be seen that it can involve a wider field than may at first be imagined for reference will be made to the production of crepe yarns which are otherwise difficult to prepare from acetate rayon and also to weighting and saponifying processes; the relationship between luster and stretching will also receive consideration. As a matter of fact, there are very few treatments of acetate rayon which cannot be influenced adversely or beneficially by the introduction of stretching and it is for this reason that dyers and finishers of materials composed of this type of rayon should be well acquainted with the powerful influence of stretching.

In the first place it must be pointed out that acetate rayon is of all textile fibers the one most susceptible to stretching; it differs from a fiber such as cotton in much the same way as copper differs from steel in being plastic and ductile. Acetate rayon resembles wool during steaming since both fibers can then be extended considerably and given a permanently increased length, but acetate rayon is characterized by the property of being readily stretched in its ordinary form, that is, without the assistance of steam or other swelling influences.

At this stage, it is perhaps as well to point out one special feature concerning the stretching of acetate rayon. A high degree of extension is better obtained by a series of progressive stretches than by one powerful rapid stretch. In the case of a quick strong pull at the rayon there is likelihood of breakage but if the rayon is stretched in stages, with sufficient time allowed between them for the rayon to accommodate its internal structure to the stretched condition, then great stretching can be obtained with less breakage.

Simple stretching of an acetate rayon can be the means of increasing its strength considerably, and by the aid of

softening or swelling agents it is possible to stretch the rayon 500 per cent in length and raise its strength from less than 2 grams per denier to 3 or 4 grams per denier. A stretch of 40 per cent can increase the strength 30 to 50 per cent, and to attain this it is necessary to apply to the rayon in the presence of steam a stretching force of about 15 grams per 100 denier.

In general it is found preferable to stretch the rayon while softened by hot water, steam, or an organic substance having a swelling or dissolving action on the rayon. Under these conditions the micellar forces appear to be reduced so that extension in length is made much easier.

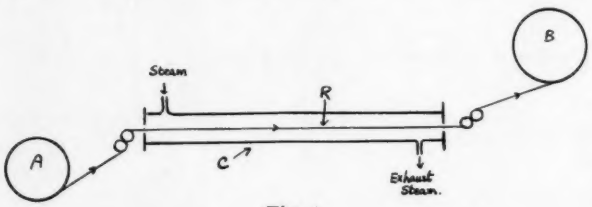

Fig. 1

For stretching acetate rayon threads with the assistance of moisture the apparatus shown in Fig. 1 is found to be very suitable; it is fully described in E. P. 438,586 and 538,585. Essentially it consists of a steaming chamber C provided with steam inlet and outlet, temperature and pressure recording apparatus, and having end-plates through which a layer of rayon threads R can pass into and out of the chamber without substantial escape of steam. In most cases it is found most convenient to stretch the rayon threads while travelling from one roller to another since under these circumstances it is easy to arrange that the drawing-on roller travels faster and so exerts a uniform stretch on the rayon. These rollers are shown at A and B. This same apparatus can be used for stretching rayon with the assistance of hot water instead of steam. The chamber C is three to six feet in length.

The exact condition of stretching are largely dependent on the temperature and humidity of the steam used. Thus E. P. 438,584, deals with stretching in steam at a temperature of 100° to 120° C., while E. P. 438,656 describes similar treatment carried out at not less than 120° C. E. P. 438,586 deals with the use of water heated above 98° C., sometimes under pressure. In these treatments it is to be noted that dry steam does not assist stretching so much as wet steam. Also high temperature steam is the most favorable to stretching. In stretching with steam, it is found that acetate rayon manufactured from cellulose acetate having a high viscosity (as measured by an acetone solution of the material before spinning) requires a higher temperature of treatment than does a low viscosity cellulose acetate. In the same manner, rayon made from cellulose acetate having a high acetyl content is more difficult to stretch than a cellulose acetate whose content of acetyl has been more reduced in the ripening process.

In considering the stretching of acetate rayon while softened by the application of substances having a swelling or dissolving action on the rayon it will be recognized that the softening treatment will have a special influence. The effect on the rayon will vary according as either the inner core of each filament is soft (with a hard cuticle) or hard (with a soft cuticle). According to E. P. 342,712 which is an early patent dealing with the stretching of acetate rayon mainly for the purpose of securing increased strength and finer filaments, the strength increase is only obtained when the softened part of the rayon is stretched and this may be carried up to two to five times its original length.

The stretching of the rayon can, of course, be advantageously carried out in conjunction with the spinning process. Thus the freshly spun rayon may be led in the usual manner through a chamber where the acetone of the spinning solution is evaporated thereby leaving the acetate rayon in a just hardened condition. It may then be further led through a liquor containing softening agents so that its cuticle is made plastic and at this stage the rayon may be stretched as desired. As previously indicated this stretching is most conveniently done while the rayon is travelling from bobbin to bobbin or otherwise from one point to another. The most suitable softening liquors are aqueous solutions of acetone, acetic acid, lactic acid, formic acid, diethyl-ethylene glycol, or organic solutions of ethyl lactate and dioxane. Thus a 50 per cent aqueous or alcoholic solution of dioxane is quite effective.

The process may be varied by also adding to the rayon spinning solution a solvent having a high boiling point, for example, cyclobutanone, acetyl-acetone, or methyl-ethylene glycol, or a plasticizer such as methyl or ethyl xylene sulfonamide, so that the freshly spun rayon remains in a soft condition for a longer period after spinning than it otherwise would when the only solvent is acetone which evaporates quickly.

As previously mentioned, stretching may be applied to acetate rayon not merely for the purpose of increasing its strength but for improving its other properties. These processes can now be considered in turn, and firstly the use of stretching in weighting treatments can be dealt with.

As is well known, real silk can be easily weighted by first steeping it in a solution of stannic chloride and then fixing the tin in an insoluble form by rinsing and subsequent treatments with disodium phosphate and sodium silicate. The property of silk which makes it respond to this treatment is its absorbent power for stannic chloride. When the same process is applied to acetate rayon it yields very inferior results for the simple reason that the rayon behaves somewhat after the manner of a waterproofed fiber and thus does not absorb sufficient stannic chloride. To overcome this, it has been found necessary to swell the rayon at the time of its treatment with stannic chloride with an organic substance so that it becomes sufficiently absorbent. Unfortunately it is found that the resulting rayon generally has a lower strength. To overcome this disadvantage recourse can be made to stretching.

Weighting processes in which swelling of the rayon is

utilized are described in E. P. 258,874, 259,899, and 355,331, and the manner in which stretching can be used in connection with these is disclosed in E. P. 439,203. Formic acid is a suitable swelling and softening agent so that it can both facilitate absorption of stannic chloride by the rayon and also assist the stretching process. The process may be carried out in the following manner:

Firstly a liquor is prepared by adding 10 parts (by volume) of formic acid to 90 parts of stannic chloride solution of 50 to 60° Tw. Skeins of acetate rayon are then steeped in this for about 40 minutes, then removed and stretched 100 to 200 per cent in length. The skeins are then rinsed in water, steeped for a few minutes in a solution of disodium phosphate of 10° Tw. to fix the tin as stannic phosphate, and finally washed and dried.

Instead of stannic chloride it is also possible to use zinc chloride under similar conditions and thus secure a weighting with zinc phosphate instead of tin phosphate.

The essential point of the method is that the intermediate stretching serves to prevent any loss of strength that a simple swelling and weighting process would otherwise produce.

For many years it has been known that acetate rayon can be delustered by boiling it in a solution of soap or other agent capable of reducing the surface tension of the liquor. In some instances this susceptibility of the rayon to boiling aqueous liquors is a distinct disadvantage and for this reason it was an important discovery (E. P. 277,089) that it could be considerably mitigated by first stretching the rayon. In the course of much investigation of this treatment of the rayon the writer found that the best results were obtained by stretching after application of a softening agent such as formaldehyde, acetone, ethyl alcohol, etc. In general, the greater the amount of stretching the higher was the resulting resistance of the stretched rayon to delustering. As an example of the process it may be mentioned that when acetate rayon yarn is steeped for ½ hour in a cold 20 per cent aqueous solution of acetone and then stretched 25 per cent in length, being afterwards washed, freed from the swelling agent and dried, it has acquired a resistance to delustering such that it can be boiled for one hour in water without loss of luster.

This effect of stretching on the luster of acetate rayon explains the difficulty which is occasionally experienced in attempts to deluster acetate rayon fabrics in jiggers with boiling soap liquors. If the fabric were simply immersed in the boiling liquor delustering would take place within a few minutes, but it is found that scarcely any delustering takes place when the fabric is drawn backwards and forwards through the same liquor in a jigger. The fact is that the fabric in its travel through the boiling liquor is under a fairly constant tension and it is this which prevents delustering.

Although it is perhaps more important that stretching should increase or maintain the luster of the rayon, it is sometimes very convenient to remember that stretching can restore the luster of the delustered rayon. Occasionally in the dyehouse an acetate rayon fabric will unintentionally be processed in too hot a liquor and so become delustered when a bright finish is actually desired. How is it possible to put right this mistake? The simplest method is that of steeping the fabric in an aqueous solution of acetic acid (about 20 to 25 per cent will be found a satisfactory concentration) and then, without rinsing, lead the fabric through a hot air tenter where it is dried and stretched simultaneously. Under these conditions it is easy to provide a suitable weft stretching; warp stretching is more difficult but the necessary amount can be obtained by having tension rails at the entry end of the tenter. It will be found that under these arrangements the luster of the fabric can be restored completely. It may be that the color of the fabric is changed by the acidity, but this can generally be restored by neutralizing the acid in an aftertreatment with dilute ammonia solution.

An interesting point may be observed with acetate rayon fabric which has had its luster restored by stretching treatment similar to that described above. It is found that, in spite of the stretching, the rayon is more susceptible to delustering in a hot soap liquor than it was originally. Thus, whereas the rayon fabric originally suffered no appreciable loss of luster when treated in a soap liquor whose temperature was below 85 to 90° C., it readily becomes delustered (after delustering and restoration of luster by treatment with acetic acid and drying under a moderate amount of stretching) when treated with soap liquor at 70 to 75° C. Possibly this ready susceptibility might be removed by applying a very high degree of stretch to the rayon in the luster-restoration process, but information on this point is not available.

Before considering the beneficial effects of stretching in the manufacture of acetate rayon crepe yarns and materials it will be useful to make brief reference to the fact that stretching of the rayon makes it more creasable, and in these days when resistance to creasing is a highly valued property in textile fabrics this change in the property of acetate rayon cannot be considered other than undesirable. The manner in which stretching affects the creasability of both viscose and acetate rayons was investigated by the writer a few years ago and the results published (J. Soc. Dyers and Col., 1930, *46*, 257), but recently the subject has been again discussed by W. Weltzien (Textilber., English Edition, 1936, *17*, 114).

The manner of ascertaining how far creasability was influenced by previous stretching of the rayon consisted of wrapping yarn Y (previously relieved from all stretch by immersion in water, followed by drying) around a rectangular strip of cardboard C (Fig. 2a), pressing this under standard conditions of time and weight, carefully removing the yarn from the card and allowing it to take its natural distorted shape or trace (Fig. 2b), and then measuring the crease angle A, it being evident that the creasability of the yarn is greater as the crease angle is smaller. In this manner, yarn previously stretched to definite amounts was tested and the curves shown in Fig. 3 were thus determined. The definite result was obtained

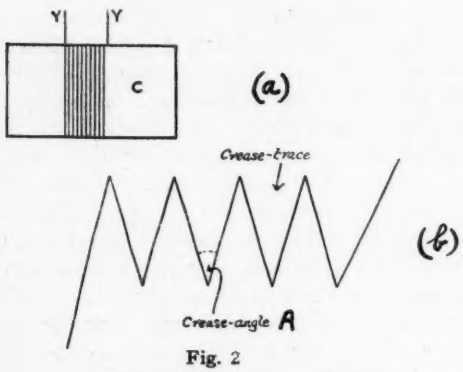

Fig. 2

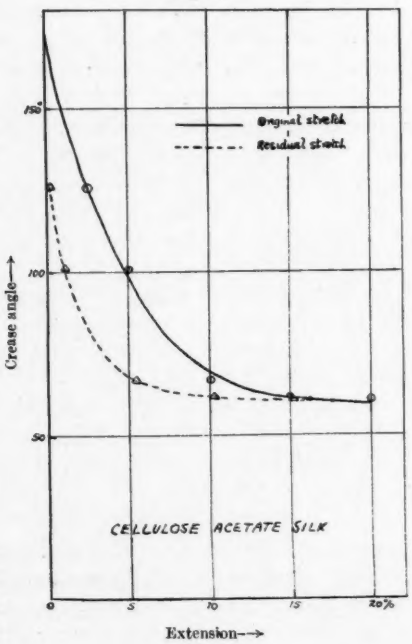

Fig. 3

that stretching invariably increased the tendency of the acetate rayon to crease, this effect being particularly noticeable in the early stages of stretching. It should here be remarked that Weltzien in his publication has wrongly interpreted this conclusion for he writes "it is an interesting fact that the tendency to crease evidently diminishes as the drafting (stretching) is increased". This wrong interpretation is evident from the following data:

Stretch	*Crease Angle*
0%	170 degrees
5	101
10	67
15	62
20	61

Attention will later be drawn to a possible method of reducing this high creasability in a stretch rayon without simultaneously affecting the advantages obtained by the stretching.

The manner in which stretching can be utilized in saponification processes is indicated by processes described in E. P. 415,412 and 538,119.

The first process involves treating the rayon with both a swelling agent and an alkali capable of producing saponification. Among suitable swelling agents are dioxane, methylethyl ketone, cyclohexanone, and acetone, these substances being generally applied in the form of a solution. As a saponifying alkali may be used caustic soda or potash, and barium hydrate. The degree of saponification may be varied considerably but generally it is not required to be more than 20 per cent if it is merely required that the rayon should have a satisfactory affinity for direct dyes. The following are examples of methods for carrying out the process:

In the first, acetate rayon yarn is led from a creel through a liquor at 40° to 50° C. containing 20 per cent of dioxane and 10 per cent of caustic soda, and is then washed and dried. This treatment makes the yarn ductile so that it can in the course of its travel be stretched in length up to 500 per cent.

In the second, skeins of yarn, previously stretched 200 per cent in length, are immersed for 12 to 16 hours in a bath containing ¼ per cent of caustic soda and 35 per cent of dioxane at 35° C. They are then washed and dried.

As will be mentioned later, it is difficult to make crepe yarns from ordinary acetate rayon, so that it is useful to note that yarns saponified and stretched as described above can be twisted to give satisfactory crepe yarns, the small amount of cellulose formed within each thread being sufficient to give the rayon the necessary elasticity which is required in a crepe yarn.

Instead of producing a uniformly stretched and saponified yarn it is possible to obtain a type of slub yarn such as is now largely used in weaving imitation linen fabrics, by applying intermittently, by means of a wick, a saponifying liquor (for example, a 25 per cent solution of caustic soda) and then drying to complete the saponifying process, followed by impregnating the yarn with a 50 per cent aqueous solution of dioxane and stretching up to 300 per cent. By this treatment (E. P. 438,119) the yarn stretches to a lower denier only in the non-saponified parts.

Turning now to the production of acetate rayon crepe yarns it may be noted that owing to its plastic or ductile properties this type of rayon is not normally adapted for this purpose. This is most unfortunate from the point of view of the acetate rayon manufacturer since crepe fabrics have been very popular during the past five years. Such fabrics have therefore had to be made with viscose or cotton crepe yarns, any acetate rayon present being there for the purpose of filling or assisting the production of special characteristics of handle or luster in the finished fabric.

The essential characteristic of a crepe yarn is that owing to its high degree of twist it immediately tends to untwist and contract in length when immersed in hot water. When an acetate rayon yarn is tightly twisted in the effort to obtain a crepe yarn it is found that the rayon filaments stretch to accommodate the strain imposed on them by twisting so that the final yarn has insufficient recovery

power when wetted. How is it possible to overcome this disadvantage of the acetate rayon yarn?

In the first place it has been discovered that a simple pre-stretching of the acetate rayon yarn has the effect of improving its behavior in subsequent twisting. Thus according to E. P. 438,588, good crepe yarns having satisfactory tensile strength (the high degree of twist necessary to secure a certain amount of crepe character in ordinary acetate rayon lowers the strength of the yarn considerably) can be made from yarn which has first been stretched up to 70 per cent (preferably 40 per cent so that the resulting change in denier is comparatively small). It is necessary to insert 45 to 75 turns per inch in such stretched yarn, and if the stretching has attained 40 per cent in length the yarn is about 40 per cent stronger than it otherwise would be.

As might be anticipated the stretching can advantageously be carried out after first softening the yarn with one or other of the various swelling agents available, for example, aqueous or organic solutions of acetone, dioxane, ethylene methylene ether, and formaldehyde. Stretching can then be carried up to 500 per cent (E. P. 437,943), and this can then be followed by twisting up to 75 turns per inch.

But according to E. P. 438,589, 438,590, and 438,591, the stretching can more satisfactorily be combined with the twisting process, and this latter process is then better carried out in two stages. E. P. 438,590 appears to be the more comprehensive of these patents and it indicates that steaming the yarn under 25 lbs. pressure in either or both stages of twisting is the most suitable softening agent to enable stretch and twist to be inserted; generally a 20 per cent stretch in length gives the desired assistance in producing a strong crepe yarn.

In general it is possible to first insert up to ¼ of the total twist (that is, 10 to 25 turns per inch) in the ordinary manner. The yarn is then run at 2 to 10 meters per minute through a short steaming chamber so that it can be stretched 5 to 25 per cent in length and at the same time given the extra twist necessary. Usually not less than two-thirds of the total twist should be inserted in conjunction with the steaming and stretching treatment. The steaming not only facilitates stretching and the production of a stronger crepe yarn but it allows twist insertion to be carried out more rapidly.

It is found that good crepe yarns can be formed by inserting 70 to 75 turns per inch in yarn of 165 denier, and 85 to 90 turns per inch in yarns of 115 denier.

Now all stretched rayons, whether they be of cellulose or acetate, have a lowered extensibility. It will be remembered that the super-high strength Lilienfeld viscose rayon (stretched after first plasticizing with concentrated sulfuric acid) suffered from this defect of poor extensibility, which otherwise expressed, is really brittleness. It is therefore important that there is a corrective treatment for this. It consists of steeping the stretched rayon in a swelling liquor so that it is free to contract in length. In this manner the rayon is given a new "set". During the treatment it may contract somewhat but it does not return to its original length; the contraction which ensues is that which gives it that addition to its extensibility which is desired so that the yarn behaves more satisfactorily in weaving and knitting operations.

The general method for thus improving the extensibility of an acetate stretched yarn is described in E. P. 389,823. Swelling is achieved by treatment of the rayon with one or more of the many organic substances capable of swelling or dissolving cellulose acetate and the length shrinkage effected should generally not exceed 15 to 25 per cent. If the rayon has previously been stretched 200 to 300 per cent it will be evident that this shrinkage does not materially reduce the first stretching or its beneficial effects.

Examples of the treatment are the steeping of stretched yarn in a 55 to 75 per cent solution of methylene chloride in benzene or carbon tetrachloride or in a mixture of 20 parts of toluene and 80 parts of ethyl acetate. It is recommended for treating ordinary yarns or crepe yarns which have been produced with the aid of stretching.

Returning now to the defect of increased creasability in stretched acetate rayon it is suggested that a shrinkage treatment as just described above might prove to be beneficial. So far no investigation of this point appears to have been made, although the writer has investigated the creasability of viscose rayon treated with swelling agents (J. Soc. Dyers and Col., 1930, *46*, 294) before stretching.

From the above survey of the manner in which stretching can be used to influence the properties of acetate rayon it is evident that much further investigation of this special treatment is required. It would appear that there are many possibilities in the stretch treatment for modifying and improving this type of rayon having regard to its special behavior towards organic substances which can easily be applied to make it more easily amenable to stretching. Viscose rayon is in a less fortunate position since there are but few substances which swell or plasticize it in a convenient manner so that it can be stretched.

ANNUAL MEETING

AND CONVENTION

A.A.T.C.C.

Providence, R. I.

December 4 and 5

Lanital, the Artificial Wool Made from Casein

H. C. BORGHETTY*

SEVERAL of the leading textile publications have given a great deal of publicity to the new synthetic fiber developed almost a year ago. It is regrettable that owing to the lack of samples on which to experiment, very little definite knowledge has been made available. Having had the good fortune to procure various samples of Lanital in fiber, thread and fabric form, the writer has been able to conduct some additional experiments which may help to form a better understanding of the fiber and its possibilities.

Our subject first requires a little clarification because of the confusion created by the over-enthusiastic claims of the inventor and by the superficial tests and analyses made by some of the first critics and investigators of the new fiber.

The inventor, Comm. A. Ferretti, probably after a lifetime of patient research has produced a fiber which is chemically very closely allied to wool. Several other scientists, years before had sought to take advantage of the analogy in the chemical constitution of casein and silk and endeavored unsuccessfully to produce an "artificial silk" which could be made on a large scale.

We should feel a little lenient towards the inventor of Lanital, who after succeeding in perfecting a spinning process suitable for an albuminoid fiber, felt rather enthusiastic and considered his product as an exact duplicate of wool. Somewhat less lenient, however, should we feel towards the investigators who hurriedly obtained small samples of Lanital "in fiber form" and examined them with a microscope and a Dynamometer to determine whether the new fiber was equal "in every respect" to wool. Lanital could not withstand this direct physical comparison to some of the finest types of wool and came thus to be regarded as a bubble to be burst as soon as larger samples, in various forms which would permit more direct comparisons, could be obtained.

The writer, however, feels that Lanital opens a new field of its own, not as a direct substitute of wool, to which it is almost chemically identical, nor as a substitute for rayon, to which it is closely resemblent physically—but rather as an economizing component of wool fabrics and as a beautifying component in the rapidly progressing development of the spun rayon fabric.

*Chief Chemist, The Aspinook Company.

Were Lanital, in its present initial state, to be used alone it could not duplicate the perfection of wool fabrics, nor would it offer any particular advantage over fabrics of spun rayon. Its potentialities lie in the manufacture of fabrics of wool or rayon, containing a percentage (20-50 per cent) of Lanital. Such fabrics would undoubtedly offer a substantial economical advantage and open a vast field for much sought for novelty effects. In the last decade we have witnessed the tremendous growth of rayon and it is not difficult to recall the bitter opposition given to the various types of artificial silks merely because they did not attain the quality and tensile strength of real silk. Who, today, would question the suitability of the now so firmly established rayon fiber? Why, then should we travel again along the same old critical road and make ourselves blind to the scientific facts that the new artificial wool fiber has possibilities of great interest. Let us pass on to the examination of Lanital:

It is produced by dissolving casein, in special equipment, so as to obtain a viscous solution which is then forced through spinning nozzles similar to those used for rayon. The coagulation of the thread takes place in a suitable formaldehyde solution.

Costs of production are relatively low although the fiber is still selling for approximately $1.10 per lb.

Being a synthetic product it does not require any cleaning or scouring and yields no waste. The fiber can also be produced in any length of staple or fineness desired. By visual examination Lanital resembles spun rayon although it has the pale cream tint of the average wool fiber. A bundle of fibers together packs heavily and does not give the impression of fluffiness we are accustomed to associate with wool. The average length of staple, available at present, is 4½ inches and its average diameter is 23 microns, thus affording comparison to 56's wool. Owing however to its great regularity of diameter it can be spun as 64's. It lacks the crimpiness of the finer wools and when viewed under the microscope appears as a smooth cylindrical fiber having longitudinal streaks. Its cross-section is rather circular but reveals the toothlike indentations which is common of viscose rayon. Its microscopic examination, touch and other physical properties thus classify it as a rayon. It burns, however, with the characteristic wool odor leaving a fine powdery ash. The fiber is elastic and particularly so when dampened.

Its tensile strength is low, averaging approximately one-half that of a fine wool of the same diameter. When wet, the tensile strength drops greatly, showing a loss of up to 60 per cent. This low wet strength is the greatest disadvantage of the new fiber and until remedied, will be the main reason for the impracticability of manufacturing pure Lanital fabrics.

It has no felting properties whatever, but when mixed with wool it greatly increases the felting action of the wool fiber. Rayon and cotton instead, as we are well aware, hinder the felting process of wool.

In chemical properties Lanital behaves as wool excepting that it is more active. Although the chemical composition is apparently that of wool there is a much lower sulfur content (approximately 0.70 per cent instead of 3-4 per cent). According to the inventor this imparts to Lanital greater heat-conserving qualities than natural wool. As there is no definite connection betwen sulfur content and heat conserving qualities this claim, however, is unfounded. The physical structure of the wool fiber is actually more indicative of low thermal-conductivity than is that of Lanital.

Lanital swells in water to the same extent as wool. In dilute alkaline solutions this swelling is greatly accentuated. If an excess of alkali is used Lanital loses its consistency and is apt to become pulpy, gelatinous and of low strength. Such a condition must be avoided because if once the material has been affected by alkali, it acquires a harsh feeling when dry. This susceptibility can be noticeably decreased by adding a small percentage of formaldehyde to any alkaline bath with which Lanital must come in contact during plant operations such as scouring and fulling.

In dilute acid solutions it behaves and swells, in like manner, to wool. It dyes as wool but possesses a greater affinity for dyestuffs, because of its ability to swell at much lower temperatures.

This greater affinity of Lanital for dyestuffs facilitates and quickens the dyeing operation and therefore it is not necessary to weaken the fiber by excessive boiling.

As Lanital dyes more evenly than wool, various groups of dyestuffs possessing good fastness properties but poor levelness can be successfully applied.

It is important to select dyestuffs which dye without a large quantity of mineral acid and which dye speedily at a temperature of about 170° F. The facility with which Lanital dyes becomes a drawback when the washing fastness of the dyestuffs is considered. Colors which dye on wool giving good fastness properties, have been known to bleed easily when dyed on Lanital. This is a result of the plastic condition of the fiber at low temperature.

Many colors, however, are capable of giving dyeings of good fastness to light and washing.

Wool and Lanital mixtures will present a problem to the dyer who will at times be called upon to dye the two fibers in an equal shade.

It will be found more simple to handle the two fibers separately.

Fabrics of Lanital and wool in the proportions respectively of 35 per cent and 65 per cent are very similar to pure wool fabrics. They have the exact appearance of wool fabrics, the same properties and, when subjected to the average tests, the Lanital content cannot be detected excepting after a tiresome microscopic examination.

A chemical method which is in use abroad for the analysis of Lanital and wool mixtures, is based on the higher resistance of Lanital to a boiling solution of sodium hydroxide in the presence of formaldehyde. It is carried out as follows:

To 90 parts boiling solution of sodium hydroxide (at 6.5 per cent) add 10 parts of a formaldehyde solution (35 per cent).

The weighed conditioned fabric is placed into the above mixture and allowed to boil exactly 2 minutes. The residue which remains is screened, washed carefully in water, then in 2-3 dilute acid solutions and finally in water. Treat with alcohol and ether, dry, condition and weigh.

It is well to use a known wool fabric as a blank in order to ascertain whether all the wool has passed into solution.

It is perhaps worthy to note that, on distillation, Lanital at times gives off formaldehyde fumes before decomposing into its components.

It is hoped, that even with its shortcomings, Lanital still represents a boon to textiles and that it will be welcomed and assisted in order to develop its growth to the utmost, improve its defects so that it may stand as a milestone in the development of the perfect synthetic fiber.

Cop-Dyeing

W. Kegel—Monats. f. Textil-Ind. 50, 18 (1935).—A brief, detailed, practical article.

One hint not made use of as often as it deserves, for determining the progress of the dyeing, consists in unwinding a suitable length of the yarn from a cop, threading it into a long needle or bodkin, and running it through the yarn on the cop in several suitable directions and depths, then marking the cop. During dyeing, from time to time, a portion of the single strand may be withdrawn and examined as to the way in which the dyeing is penetrating the whole bulk of the winding.

Another point mentioned is a warning as to the careless use of old standing baths of sulfur colors—the danger of some of the dyestuff having been thrown out of solution by oxidation of the solvent sulfide, and present in suspension, thereby inviting the probability of producing dull or muddy dyeings; and also the probable presence of finely divided and suspended sulfur being present in such a bath for the same reason, the sulfur being responsible for the yarn coming out with a finish harder than it should be.

Other valuable practical points are also included.

Yarn and Cloth Dyeing*

Part I—Preparation of Yarn and Cloth to Prevent Uneven Dyeing and Off Shades

FREDERICK REIS

THERE is one dyer who has not to worry if his dyeings are even, or not, and to whose dyeings no one objects, even if the blacks are not evenly dyed. This lucky man is the raw-stock dyer. In many of the old type stock dyeing machines it is really impossible to get the lots evenly dyed; the stock clusters together in lumps, which take more dye on the outside than on the inside. But that does no harm because the dyed stock is put through the carding and spinning processes to be thoroughly mixed, sometimes with undyed grey stock. What matters is the color of the yarn which is gained at the end. The raw-stock dyer knows from his experience how to take samples from different parts of his lot, how to have them mixed, to reach finally his goal, the desired shade.

Every other dyer has to take the greatest care that his dyeings, whether they may be yarns or piece goods, show the same shade through the whole pieces, or the whole lot. Uneven dyeings are far more serious than off-shades are. Goods which are slightly off shade may be sold to an odd customer as an odd lot, or at a slight discount, which is mostly lower than the cost of the re-dyeing would have been. Uneven goods are unsaleable and mean invariably a return to the dye house, but while off-shades, even if they come back for re-dyeing, can mostly be easily touched up and brought to the right shade with only a small loss of time and at a low cost; to fix up streaky dyeings is always costly, in the time necessary, in chemicals and dyes, and the result obtained is not always certain. The goods may get irreparably damaged. For instance, silk crepes or silk hosiery will get most certainly chafed through the prolonged handling, and will be only saleable as seconds, at a big discount. Skein-dyed rayon yarns, especially the finer deniers, will get tangled up, become not windable, and the result will be a complete loss.

Precautions During Yarn Winding and Knitting

To avoid uneven dyeings, the right preparation of the goods has to start, not in the dyehouse, but in the mill. Sometimes as in the case of barriness in hosiery or in piece goods, the fault lies with the knitting or weaving departments. Mixing of yarns of different origin, it may be pure silk, or rayon or wool; it always results in spoilt goods.

The tension on the different bobbins in the knitting process may be unequal, or in the weaving, there may be some quills tighter wound than others; or differently steamed. In the package and beam-dyeing a changing tension of the yarn during the winding process will cause faulty dyeings. If some packages are tighter wound than others, they will take the color in a different way and the result is a spoilt batch.

In knitting the use of a good soluble oil must be highly recommended. The use of cheap oil for lubricating the knitting yarns is the poorest saving which a knitting mill can make. The price they have to pay for it is mostly many times higher than the money they save in using cheap oil. Only a good soluble oil should be used, and if a mineral oil, on account of the lower price, should be preferred, only the right kind and the right mixture with a soluble oil should be used. Some mineral oils stick to the yarn and can never be perfectly scoured out, and the same happens with some vegetable oils, which get rancid and oxidize on the fiber, form a coating that protects the fiber from penetration, and the result is unevenly dyed goods, with the added expense of re-scouring and re-dyeing.

The same thing happens with woolen goods; with rayon crepes and taffetas, if a size is used which is hard to remove. If the size comes out of the goods, only partly, while a part stays in, what else can be expected than unevenly dyed goods?

Importance of Thorough Scouring Before Dyeing

From what has been said, it is clear that a very good scouring has to precede the dyeing operation, even if the right oils and sizes have been used. The dyer has to make sure that no oil or size is left in the goods. If afterwards he should run into trouble, he will then know that he has to look for the cause somewhere else.

Wool is generally scoured with a low-titer soap as olive oil or oleate soap in conjunction with a little alkali as soda ash or ammonia. This is the cheapest way and in my opinion still the best one. But it makes a thorough

(Continued on page 550)

*Reprinted from Canadian Textile Journal.

PROCEEDINGS OF THE
American Association of Textile Chemists and Colorists

OCTOBER 5, 1936

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Members should notify the **Secretary** immediately of all address changes

Report of the Nominating Committee

THROUGH the Secretary of the Association, serving in accordance with the Constitution as Chairman without vote, the Nominating Committee presents these candidates for election in 1936:

For President of the Association—WILLIAM H. CADY.

Vice-Presidents—ELMER C. BERTOLET and ALBAN EAVENSON.

Treasurer—WILLIAM R. MOORHOUSE.

Councilors at Large—B. L. HATHORNE and G. R. KREMERS.

The Constitution states that counter nominations for any office, signed by at least ten active members and filed with the Secretary not later than November first, shall be placed on the ballot. As recently amended, the Constitution provides for selection of a Secretary by the Council instead of by general election. The Committee therefore presents no candidate for this office.

By the Voting Members of the Committee:

JAMES E. BOLDERSON of the Piedmont Section,

HUGH CHRISTISON of the Northern New England Section,

G. H. DUBOIS of the South Central Section,

LESTER R. FOX of the Mid-West Section,

SAMUEL I. PARKER of the Southeastern Section,

CHARLES A. SEIBERT of the Philadelphia Section,

HAROLD DEWITT SMITH of the New York Section,

BEN VERITY of the Rhode Island Section, and

HAROLD C. CHAPIN, *Chairman ex-Officio*.

Oxidation of Wool

Alkali Solubility Test for Determining the Extent of Oxidation*

MILTON HARRIS and ARTHUR SMITH†

ABSTRACT

Oxidizing agents attack the disulfide groups of the cystine in wool and increase the solubility of the wool in alkaline solutions. The determination of the alkali-solubility may be used as a measure of the extent to which the wool is oxidized. The method is applicable as a control in practical processes, such as bleaching and chlorination, and offers a measure of the extent to which wool is degraded by photochemical reactions. Data are presented which indicate a relationship between the chemical and physical degradation of wool fibers.

I. INTRODUCTION

In practical processing, wool is often exposed to conditions in which it may become partially oxidized. Under extreme conditions, such as may be encountered during severe bleaching or chlorination, the wool is oxidized to such an extent that the damage is readily detectable by visual examination or by ordinary physical testing methods. In well-controlled processes, however, the amount of oxidation is barely or not at all measurable by ordinary testing methods. The incipient damage which may be produced by mild oxidation is usually developed and accentuated during subsequent processing. It is apparent, therefore, that analytical methods for determining the extent of oxidation of wool are of importance for effective control during its processing.

In a series of studies relating to the oxidation of wool and to the effect of alkalies on untreated and on oxidized wool[1, 2, 3, 4]** it was shown that the main point of attack by both oxidizing and alkaline reagents was the disulfide group of the cystine in wool. It was also shown that the oxidized wool is more susceptible to alkaline treatment than untreated wool, and that the extent to which the wool is oxidized bears a functional relationship to the decrease in the cystine content and to the increase in the alkali-solubility. Although determinations of either the cystine content or the alkali-solubility are measures of the extent of oxidation of wool, the former is not practical since it requires equipment, technique, and time which are not ordinarily available in the average textile-mill laboratory. On the other hand, the latter method is comparatively rapid and simple, and, in most instances, appears to be more sensitive.

The present paper deals with the application of the alkali-solubility test to a number of practical processes in which wool is subjected to oxidation reactions. Comparative data obtained from corresponding cystine analyses are also presented.

II. METHODS

Alkali-solubility was determined by treating the wool with a 0.1 N solution of sodium hydroxide at 65° C. for 1 hour, the ratio of wool to solution being approximately 1 to 100, by weight. The wool was recovered on a Büchner funnel, washed with about 2 liters of water, dried to constant weight at 105° C., and the loss in weight determined. Samples of wool which had been severely oxidized became gelatinous during the alkali treatment. These samples were partially dried in an oven at about 50° C. for 1 hour and then dried at 105° C. The cystine content was determined by the Sullivan method[5]. Data showing the reproducibilities which may be expected by both methods are given in Table 1.

TABLE 1.

Results of six analyses of untreated wool yarn to show reproducibility.

The values are based on the oven-dry weight of the wool.

	Alkali-solubility	*Cystine content*
	12.5	11.5
	12.9	11.4
	12.9	11.3
	11.6	12.0
	13.1	11.3
	12.5	11.5
Average	12.6	11.5
Average deviation from the mean	0.4	0.2

III. APPLICATIONS OF THE ALKALI-SOLUBILITY TEST

1. Hydrogen Peroxide Bleaching

In a previous paper[2] on the effect of hydrogen peroxide on wool, data were presented showing the effects of vary-

*This is the fourth paper of a series of studies relating to the oxidation of wool. The work reported here was made possible by a grant from the Textile Foundation, Inc.

†Research associates at the National Bureau of Standards, representing the American Association of Textile Chemists and Colorists.

**The numbers here and elsewhere in the text relate to the numbered references at the end of this paper.

ing the concentration, temperature, and pH of the hydrogen peroxide solutions and the duration of the treatment. Data taken from that paper on the effect of varying the temperature of the bleach bath are presented in Table 2 as a typical example of the use of the alkali-solubility test for studying and controlling the bleaching process.

TABLE 2.

Effect on wool of 2-volume (0.6%) solutions of hydrogen peroxide at various temperatures from 23 to 80° C, for 3 hours; and the alkali-solubility of the treated wool.

Temperature of H_2O_2 solution	*Alkali-solubility*	*Cystine content after treatment with H_2O_2*
° C	%	%
23	9.7	11.2
35	13.6	11.3
50	19.4	10.8
65	31.6	9.8
80	100.0	7.4

The use of the method as a control for commercial bleaching operations was also investigated. The effects of successive commercial bleaching treatments on wool cloth are recorded in Table 3. The values for the swelling, shown in the last column of Table 3, were obtained by Von Bergen's method[5*]. The results obtained by all of the methods are in good agreement, but the swelling method, like that for cystine, requires technique and equipment which are not usually available.

TABLE 3.

Effect of commercial bleaching on the alkali-solubility, cystine content, and swelling in alkali of wool cloth.

The wool was bleached in hydrogen peroxide at pH 9.8 and at a temperature of 120° F. The concentration of the hydrogen peroxide and the duration of the treatment are indicated in the table. After each bleaching treatment, the wool was washed, immersed for 20 minutes in a bath containing 1.2 per cent of sulfuric acid and 0.25 per cent of sulfur dioxide and washed in running water for 15 minutes.

Sample	*Treatment*	*Alkali-solubility*	*Cystine content*	*Swelling*
		%	%	%
1	None	11.1	12.8	12.4
2	Bleached with 2.71 vol. H_2O_2 for 1 1/3 hr.	17.2	11.7	14.7
3	Sample 2 bleached with 2.62 vol. H_2O_2 for 1½ hr.	20.3	11.3	18.6
4	Sample 3 bleached with 1.70 vol. H_2O_2 for 1 hr.	31.4	10.8	21.2

The values obtained for the alkali-solubility of a given wool sample will vary not only with the extent of oxidation but also with the construction of the material being tested; that is, the amount of surface exposed. For example, a given sample of wool will lose more weight when it is in the form of yarn that when it is in the form of a closely woven fabric. Consequently, in using the alkali-solubility test as a control in practical bleaching, the tolerances chosen will depend on the type of material being processed as well as on the uses to which it will ultimately be subjected.

*These determinations were made by Dr. Von Bergen, chief chemist, Forstmann Woolen Co., Passaic, N. J.

2. Chlorination and Bromination

The use of chlorine and bromine for the production of unshrinkable wool textiles has recently received much attention. In addition, the chlorination process is frequently used to improve the luster of wool. The great affinity of wool for these halogens and the ease with which the fiber is damaged by them are the chief reasons for their limited use. The evaluation and minimizing of the damage are two of the important problems connected with the successful use of the processes. Since the degradation of wool by halogens appears to be brought about by oxidation reactions, the alkali-solubility test was used to study the effects of the chlorination and bromination processes.

Samples of wool yarn each weighing approximately 4 g, were treated for 20 minutes at room temperature with 160 ml. portions of sodium hypochlorite and hypochlorous acid solutions, varying in concentration from 1 to 8 per cent of chlorine based on the weight of wool. The effects of the treatments are recorded in Table 4.

TABLE 4.

Effect on wool yarn of sodium hypochlorite and hypochlorous acid solutions of various concentrations at room temperature for 20 minutes.

Treatment	*Concentration chlorine* percent*	*Change in wt. during chlorination* percent	*Alkali solubility* percent	*Cystine content* percent
None	0	0.0	11.0	11.6
NaOCl	1	— .1	15.3	9.5
NaOCl	2	— .3	15.2	9.2
NaOCl	3	—1.1	29.7	9.4
NaOCl	4	—2.4	28.4	9.5
NaOCl	6	—5.2	26.0	9.5
NaOCl	8	—8.0	25.3	9.2
HOCl	1	+2.2	24.0	9.3
HOCl	2	+2.6	30.1	9.0
HOCl	3	+0.5	34.9	8.9
HOCl	4	—6.3	36.6	7.9
HOCl	6	—7.9	37.9	6.7
HOCl	8	—13.1	43.5	6.8

*Based on the weight of wool.

With the exception of those samples treated with sodium hypochlorite solutions of concentrations higher than 4 per cent, the alkali-solubility increased and the cystine content decreased with increasing concentration of chlorine. The apparent discrepancies may be attributed to the fact that the more concentrated solutions of sodium hypochlorite probably dissolve a portion of the wool that would ordinarily be removed by the subsequent alkali treatment.

It has long been known that the chlorination process tends to reduce the wearing qualities of woolen fabrics. Various investigators have attempted to estimate wearing quality of chlorinated wool by relating it to tensile strength, extensibility, the presence or absence of scales, the solubility of the wool in acids and alkalies, and the altered affinity of the wool for dyestuffs. While chlorination un-

doubtedly influences these properties, a definite relationship between them and wearing qualities has not previously been demonstrated.

From the standpoint of physical stability, the disulfide group constitutes what is probably the most important connecting link in the wool molecule. Since it has been shown that chlorine attacks the disulfide group and increases the solubility of wool in alkalies, it seemed desirable to relate results of the alkali-solubility test to those obtained from actual wear tests.

Samples of carpet wools* which had been treated with various concentrations of sodium hypochlorite solutions for the purpose of producing a desired luster were analyzed for alkali-solubility and for cystine content. Wear tests on similarly treated carpets were made on a carpet wear-testing machine[6]. The numerical data are given in Table 5 and shown graphically in Figure 1. The results not only demonstrate further applications of the alkali-solubility test, but also indicate a definite relationship between the physical and chemical degradation of the wool fiber.

TABLE 5.

Effect of different concentrations of sodium hypochlorite solutions at 105° F. for 1 hour on carpet wool. The ratio of wool to solution was 1 to 20, by weight.

Available chlorine g/liter	*Wear Index**	*Alkali-solubility* percent	*Cystine content* percent
0.0	72.5	15.6	9.8
2.1	64.1	21.6	8.9
4.0	62.7	22.8	8.4
5.2	64.1	24.3	8.2
8.6	41.9	29.6	8.0
16.8	39.4	34.1	7.4

*The wear index of the carpet is the number of thousands of revolutions of the turntable required to wear the pile of a carpet down to one-fourth of its original pile thickness.

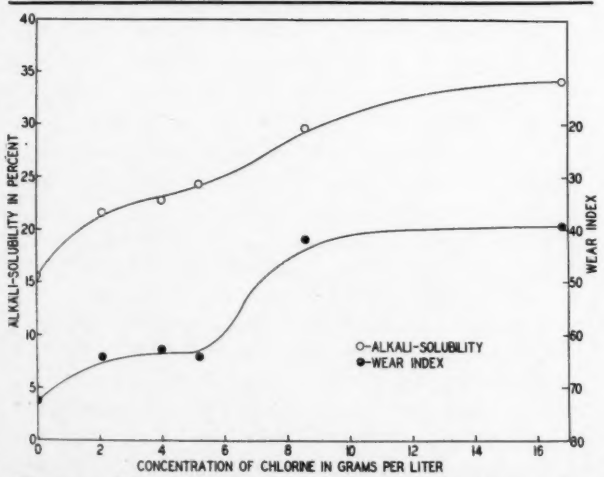


Figure 1—Effect of treating wool with different concentrations of sodium hypochlorite solution at 105° F. for 1 hour on its alkali-solubility and on the wear index of carpets made from the wool.

3. Effect of Light on Wool

The results of numerous investigations have shown that the breaking strength, milling properties, affinity for dyestuffs, and sulfur and nitrogen contents of wool are altered during the photochemical decomposition of the fiber. However, the determination of any one of these changes does not afford a very sensitive or convenient method for measuring the amount of degradation produced by the action of light. In a recent publication[7] relating to the photochemical decomposition of wool, it was shown that the extent to which wool is degraded during irradiation is directly proportional to the decrease in cystine content and to the increase in alkali-solubility. While subsequent work has indicated that the primary action of light on wool may not necessarily be an oxidation reaction, the chief point of attack is still the disulfide group of the cystine in the wool, and the alkali-solubility is correspondingly increased.

Samples of wool top were exposed to the radiation of a glass-enclosed carbon arc for different lengths of time from 5 to 100 hours. The effects of the exposures are shown in Table 6. When the data obtained by both methods are plotted against each other as shown in Figure 2, it is readily demonstrated that there is a linear relationship between the increase in the alkali-solubility and the decrease in the cystine content of the exposed samples of wool.

TABLE 6.

Effect on wool top of exposure to the radiation from a glass-enclosed carbon arc for different lengths of time.

Exposure hours	*Alkali-solubility* percent	*Cystine content* percent
0	11.9	12.2
5	14.5	11.9
15	17.2	11.1
30	21.9	10.4
50	32.2	8.6
100	36.2	7.9

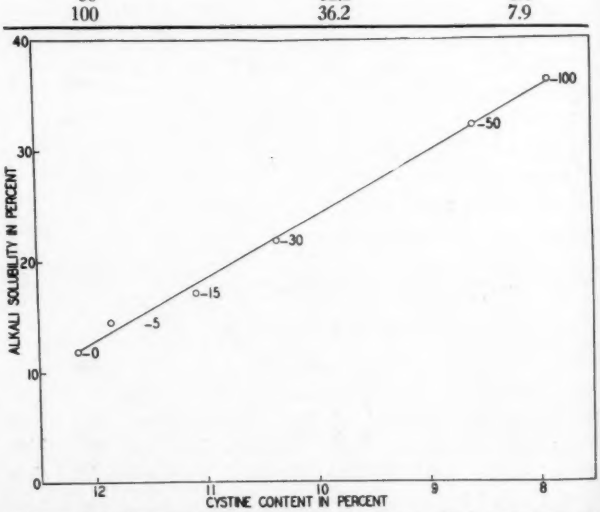


Figure 2—Effect on cystine content and the alkali-solubility of wool of exposure to the radiation of a glass-enclosed carbon arc. The figures on the curve represent the duration of exposure, in hours.

*The wool used for these experiments and the wear tests on the carpets were furnished by G. E. Hopkins, technical director of the Bigelow-Sanford Carpet Co. Inc., Thompsonville, Conn.

IV. CONCLUSIONS

The alkali-solubility test as outlined in this paper is comparatively rapid and gives sufficiently reproducible results to recommend it as a method for determining the extent of oxidation of wool and as a control method in practical wool processes involving oxidative reactions. The use of the method as a control for a specific process requires the determination of limiting alkali-solubilities. These limits will depend on the type and construction of the material being processed and the use to which it will ultimately be subjected.

V. REFERENCES

[1]J. Research N.B.S. *15*, 63 (1935) RP810.
[2]J. Research N.B.S. *16*, 301 (1936) RP875.
[3]J. Research N.B.S. *16*, 309 (1936) RP876.
[4]J. Research N.B.S. *16*, 475 (1936) RP885.
[5]Proc. Am. Soc. Testing Materials (II) 35, (1935)..
[6]J. Research N.B.S. *12*, 155 (1934) RP640.
[7]J. Research N.B.S. *17*, 97 (1936) RP904.

Standard Wash Fastness Samples

Cotton, Wool, Silk

The standard samples which have been in preparation for some time by the Sub-Committees on Fastness to Washing of Dyed Cotton and Dyed wool are now ready for distribution, and the original standard silk sample cards have been revised to correspond with the new system of classification first introduced in the 1934 Year Book.

These standards have all been carefully dyed with the dyestuffs and according to the dyeing methods recommended in the 1934 Year Book and each set includes a dyeing representing each of the different classes of fastness.

With these sample dyeings for reference it will be possible to accurately grade the fastness to washing of any dyed cotton, wool, or silk fabrics, by comparing them with the standards after subjection to the standard washing tests as approved by the Association.

The A.A.T.C.C. is now prepared to furnish these three sets of washing standards for $3.00 or $1.00 per individual set which is to cover the cost of preparation.

All inquiries concerning these washing standards should be addressed to the Chairman of the Research Committee.

LOUIS A. OLNEY,
LOWELL TEXTILE INSTITUTE,
LOWELL, MASSACHUSETTS.

UNEMPLOYMENT REGISTER

Members of this association, who are without employment, should forward to the secretary a statement as to their qualifications and experience. This information will subsequently appear on these pages with an identifying key number. Employers are also requested to file with the secretary or the American Dyestuff Reporter any vacancies which may occur in their businesses.—H. C. Chapin, Secretary, Lowell Textile Institute, Lowell, Mass.

Key: A—Laboratory and research; B—Dyeing or printing; C—Finishing; D—Sales; E—Instruction; F—Executive.

NOTE: PERSONS WHO HAVE OBTAINED EMPLOYMENT SHOULD NOTIFY THE SECRETARY OR THE AMERICAN DYESTUFF REPORTER AT ONCE. Prospective employers may file vacancies either with the secretary or the American Dyestuff Reporter.

A-6

Education—Analytical Chemistry and Dyeing Course, Lowell Textile Evening School.

Experience—Seven years as print color and dye chemist in printing, dyeing and finishing plants; recently in charge of textile printing department of dyestuff manufacturer.

A-B-2

Education—Lowell Evening Textile School, 1917.

Experience—Five years' experience in hosiery dyeing, full fashioned hosiery of silk and cotton and silk, also men's hosiery containing rayon, wool, cotton and celanese. Several years experience in laboratory work. Has also had experience in jig-dyeing of cotton piece goods, slub and top dyeing.

A-B-4

Education—B.T.C. 1934, Lowell Textile Institute.

Experience—Assistant chemist in cotton knitting plant; second-hand in woolen knit goods dye house. Will go anywhere; references.

A-B-5

Education—Graduate of the University of Lausanne, Switzerland. Doctor's degree in Chemistry. Knowledge of French and German.

Experience—Eleven years with large bleaching, dyeing, printing and finishing plant as assistant Chemist and then Chemist in charge of the Laboratory. Experience in dyeing and printing cotton and rayon fabrics; research and analytical work. Woman.

A-B-7

Education—Evening school in textile dyeing.

Experience—2 years laboratory in dyehouse; 9 years dyer and foreman on hosiery, ribbons and rayon; 2 years assistant to superintendent. Can handle help efficiently. Desires position as supervisor or demonstrator of dyestuffs. Age 30; married. Prefers vicinity of New York.

A-B-C-2

Education—Graduate of Lewis Institute of Engineering of Chicago and graduate of Philadelphia Textile School (Chemistry and Dyeing department).

Experience—Has had extensive experience as assistant chemist and colorist in silk printing, dyeing and finishing; also dyeing raw stock wool; and dyeing and finishing cotton and rayon. Age 30; married; references.

A-B-C-3

Education—3 years at Brown University and Drexel Institute.

Experience—2½ years in dyestuff laboratory; 3 years as second-hand, dyeing indanthrene and direct colors on rayon skeins; 6 months as boss dyer on silk and cotton ribbons and hosiery; 3 years overseer of dyeing and finishing rayon tubing. Can handle laboratory, dyehouse, finishing or outside service. Age 30; married.

A-B-C-D-E-1

Education—B.S. Chemistry, Mass. Institute of Technology.

Experience—Plant and laboratory work. Knowledge of wool scouring; cotton, worsted, celanese and rayon slashing; bleaching, dyeing, printing and finishing of cotton cloth; printing of Plissé; manufacture of soaps, finishing compounds and wetting-out agents; analytical work; solution of mill manufacturing difficulties; dyestuffs and their application to wool, cotton, rayon; textile teaching experience; paper mill work; some sales experience; references; married; 43 years old.

A-B-C-F-1

Education — Five years chemistry and engineering, Brown University (Evenings).

Experience—1 year general superintendent at print works (shirtings, dress goods, etc.; cotton and rayon). 12 years chief chemist and superintendent of large bleachery and dyeworks (cotton, rayon and silk piece goods). 4 years chemist in charge of control work in bleach, print and dye works (cotton, wool and rayon piece goods). 9 years chief chemist and assistant superintendent in gas and oil manufacture. Practical dyer and finisher and can handle help efficiently and get results. Can help a plant seeking to improve their vat dyeing, shrinkage results, finishes and service to customers. Age 45; married.

A-C-1

Education—4 years at Newark Evening Technical School in Chemical Engineering.

Experience—8 years in manufacturing, research, testing of soaps, oils, gums and finishes and application of same in all phases of the textile industry. Age 23, single. References.

A-E-1

Education—Ph.D., Univ. of Illinois, studied chemical engineering at Columbia, licensed chemical engineer, New Jersey.

Experience—10 years' experience teaching in colleges, subjects included chemical and textile subjects. Has had broad experience in industrial work including experience in testing materials, research and consulting. Will go anywhere; references.

B-1

Education—Educated and trained in chemistry and calico printing in Glasgow, Scotland.

Experience—Has been with large print works as colorist for 13 years producing first class work on cotton, rayon, wool and silk fabrics. References.

B-2

Experience—Boss dyer with one firm for 18 years, divisional supt. at print works for 1 year, in charge of processing and dyeing of cottons and rayons at large bleachery for 6 years. Prefers bleachery in East but will go anywhere. References.

B-3

Experience—Foreman piece dyer for the past 21 years. Can dye the following: celanese, rayon, cotton backs, wool, silk and mixed fabrics. Has knowledge of finishing and laboratory work.

B-6

Education—Graduate R. I. School of Design.

Experience—5 years in bleachery, 7½ years as assistant dyer, 2 years as boss dyer and 3 years as superintendent of dyeing and finishing. Married, 33 years old. References.

B-7

Experience—Eight years as boss dyer on skeins and ribbons. Over ten years as chemist and head dyer for a large hosiery mill. Experienced on Silk, cotton, rayon and wool in skeins, ribbons, piece goods and all kinds of mixtures. Willing to go anywhere. Not afraid to work or face responsibility. Can handle help efficiently.

B-8

Education—Chemistry and Dyeing Department, Philadelphia Textile School.

Experience—Eleven years experience as chemist and boss dyer on the following: woolen, worsted and cotton yarn; woolen, worsted and union piece dyes on both ladies' and men's wear; wool, cotton, shoddy and mohair raw stock. Age 33, married, will go anywhere. References.

B-9

Experience—Hosiery dyer with fifteen years' experience on high grade silk hosiery; familiar with all types of machines. Age 43, married. Will go anywhere.

B-14

Education—Rhode Island School of Design.

Experience—Familiar with all classes of wool dyeing. Seven years with large carpet mill as dyer and processor of washed oriental rugs. Will go anywhere, married, 37 years old. References.

B-17

Education—Lowell Textile Institute (Chemistry and Dyeing Course) 1916; extension courses at Brown University.

Experience—6 months dyeing wool at finishing company; 2½ years research work on bleaching, dyeing and finishing at dye works; inspector of textile equipment, U. S. Ordnance Dept., during war; 15 years as superintendent of dyeing at finishing company, including all types of colors on cotton piece goods and some rayon and celanese; handled chemical work at last named plant for many years as well as dyeing. Age 40, married, prefers East. References.

B-20

Education—Chemistry and Dyeing Dept., Philadelphia Textile School.

Experience—Thirteen years' experience as boss dyer on the following: rayon and cotton skein and piece goods and knitted fabrics. Raw stock dyeing in pressure dyeing machines. Age 35 years, married, can handle help efficiently.

CALENDAR OF COMING EVENTS

Meeting, New York Section, Swiss Chalet, N. J., October 23, 1936.

* * *

Meeting, Philadelphia Section, Penn Athletic Club, Philadelphia, Pa., October 9, 1936.

* * *

Annual Meeting, Providence, R. I., December 4 and 5, 1936.

The Sixteenth

ANNUAL MEETING AND CONVENTION

UNDER AUSPICES OF THE R. I. SECTION

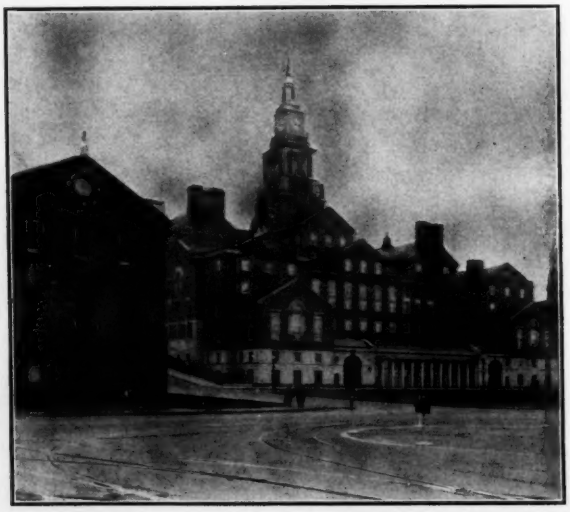
Providence, the scene of the coming annual meeting of the A.A.T.C.C. on December 4th and 5th, will be of particular interest to all who are planning to attend because of the Tercentenary Celebration being held this year.

Providence was founded in 1636 by Roger Williams, a fugitive from civil and religious intolerance of Massachusetts Puritans. His settlement was dedicated to the shelter of "persons distressed for conscience" as were succeeding settlements on either side of Narragansett Bay which united to form the colony of "Rhode Island and Providence Plantations." This colony proclaimed its independence of Great Britain two months before the declaration in Philadelphia.

As a modern city, second largest in New England, it is the center of one of America's leading industrial areas and the birthplace of the Textile industry in this country. Providence is considered an unusually attractive city, situated on seven hills at the head of Narragansett Bay.

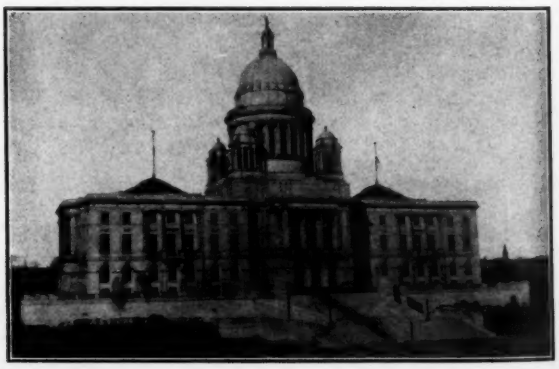
DECEMBER 4TH AND 5TH PROVIDENCE, R. I.

The picture below contrasts old and new Providence.
Left—Chamber of Commerce Building (1774)
Right—Providence County Court House (1933)



RHODE ISLAND STATE CAPITOL, PROVIDENCE

Overlooking the city from a hill north of the civic center, stands the State House which may be seen for miles by travelers approaching the city. It is built of white Georgia marble with a marble dome, one of the few in the world. Surmounting the dome is a colossal bronze statue known as the "Independence Man."



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ADVANCED STUDY HELPS MASTER YOUR JOB

THE man with a technical education working in the mill with a more or less secure job, perhaps as foreman, seems very frequently to think that the period for study is over. He is now acquiring practical experience and seems to acquire, at the same time, the idea that nothing else is very important.

True, practical experience is extremely important and you cannot get it from books; but, it is far more practical and effective if you add to it the things that can be obtained from continued study.

If you understand difficult textile problems the ordinary ones will be more easily solved. This follows from common experience. The understanding of an advanced book on any subject makes the elementary book seem much easier and simpler on a rereading. Algebra becomes much easier after a couple of courses in more advanced mathematics. How easy the early courses in chemistry seemed after you had got well into advanced courses! If your life work consisted of relatively simple mathematics or chemistry it would be easier if you had taken advanced courses in these subjects even though there were no obvious direct use for them. We believe that the same principle applies to textiles.

Many textile occupations are supposedly routine work but how many of them are actually routine? There are changes from season to season, and sometimes more fundamental developments. There are things that go wrong, and troubles inherited from other departments. Some of these may have routine solutions while others may be very tricky problems whose solution is very elusive.

It is a little difficult to talk convincingly in generalities but it seems to be plain common sense that difficult practical textile problems, whatever their nature, would be solved more easily from a background of advanced study than from ordinary experience alone.

This advanced study has a fearsome sound but we are thinking mainly of reading the accounts of the more scientific researches on textiles and on the materials which are used on them. There are no books, either elementary or advanced, which give ready-made solutions to textile troubles except perhaps for an occasional bit of luck in finding a desired answer.

The solutions are based mostly on the principles of chemistry and physics but here, again, they are not included in the ordinary books on these subjects.

The real science of textiles, which is the basis for solving its technical problems, is to be found in the textile research papers such as are now being published in increasing numbers in various countries. There are enough printed in the English language or abstracted in British and American publications to satisfy the needs of almost any reader. The real research papers in the AMERICAN DYESTUFF REPORTER are among the best "even if we do say it, as shouldn't."

If you have not been making it a practice to read the deeper papers you will find that it is often not necessary to read a whole paper to get most of the good from it. The author usually gives a summary of the present standing of his problem and the theories or underlying principles upon which he is working, an outline of the methods employed and discussion of his conclusions. These usually give a most up-to-date view of the subject, better and more recent than that in any text-book. Then, if you are interested in the ingenious methods which were used to overcome obstacles and to produce new results, you can read them, too.

The theory of dyeing, by which is really meant the explanation of the mechanism of the relations between dye and fiber, lies at the bottom of all dyeing operations whether or not we realize it, or care to admit it. (Yes, we have actually seen educated mill men who did not care to admit that the theory of the subject could possibly have anything to do with their own very practical affairs.) Similarly the elastic properties including qualities like ability to stretch, and plasticity, as well as chemical and physical structure (as of cellulose and wool), are at the basis of most finishing work.

The application is not always easy to see, perhaps because you need to study it much more or perhaps because you have become overwhelmed by the idea that production is the only real concern of the mill man. It is most certainly his main job but efficient production depends upon much more than the routine mechanics and chemistry of turning out the goods.

We are prone, when a difficulty arises to seek the quickest solution and to call it settled, rather than to go to the very bottom and find out what was really the matter. Production requires that we rush on to something else. Advanced study of the science of textiles gives a background for really solving such problems and helps to avoid the same difficulty again.

The literature will not often have the latest practical information because few are at liberty to write it. But, it

contains good suggestions even though they are not actually written into it as such; and they are far better than no outside help at all. The literature does contain the fundamental things of which we have spoken. The making, dyeing, and finishing of textiles depends upon these things and mastery of them means a greater mastery of your job.

KURT W. FRANKE

DR. KURT W. FRANKE, chemist at the experimental station of South Dakota State College died at his home in Rochester, Minnesota at the age of 47. He was a member of the Mid-West Section of the American Association of Textile Chemists and Colorists.

Yarn and Cloth Dyeing

(Continued from page 540)

rinsing necessary. Any trace of soap left in the goods will be dangerous, resulting in soap spots and uneven dyeings. If the soap is replaced with one of the sulfonated alcohols, there is no rinsing after scouring necessary. Just a new bath with the dye-liquor is needed. The sulfonated alcohols are not influenced by acids, dissolve in acid solutions and will never be the cause of any trouble in the dyeing. On the contrary, sulfonated alcohol in the dye bath will help in levelling, as I shall explain later on.

The higher cost of the sulfonated alcohol against soap is fully made up in the saving of time.

For cotton yarns a boil-off with a little soda ash and a cheap sulfonated oil is perfectly sufficient. If the goods have to go into a bleach, and hydrogen peroxide has to be used, there is no boil-off necessary. The boil-off is done with the bleaching in one operation.

Cotton piece-goods are sized in the warp with starch, and to remove the starch the goods are treated at a medium temperature with a malt extract which contains an enzyme. This turns the insoluble starch through a chemical process into sugar, and makes it water soluble. Perfect removal of the starch is tested with potassium iodide-iodine solution. Traces of starch are shown by a dark-blue stain. Only the complete removal of the starch from the goods guarantees evenly dyed goods.

Pure silk is an animal fiber, two fine filaments are embedded together in a coating of sericine, a kind of gum, which emulsifies readily in a boiling soap solution. This silk-degumming process is generally known and every dyer who handles pure silk, knows the importance of the complete removal of all the gum and watches it carefully. Just the same, it happens sometimes, mostly when old yarns or piece goods have to be processed, that age and oxidation made the gum harder to remove. It stays partly in the goods when they are submitted to the regular boil-off and the dyeings come out uneven, and have to go back to the dyer for reprocessing.

Removing Boil-Off Oils and Sizes from Rayon Goods

While on pure silk too, only perfectly emulsifiable oils and sizes should be used, and mostly are used. I believe that this question is not so important with natural silk as it is with artificial rayon fibers. The boil-off to which pure silk is submitted, removes together with the gum all oils and sizes which form only a coating on the gum, and emulsifies them properly. The artificial rayons have no such protective coating as the silk has with its gum, and a great part of the trouble the rayon dyer encounters concerning unevenness, is due to the use of incorrect oils and sizes, and the impossibility of completely removing them. Knitting oils I have mentioned before.

As sizing for the warp on pure silk goods linseed oil is most generally used. This process originated with the old silk weavers in Lyons in France. Linseed oil oxidizes and hardens on exposure to the air. All our paints contain linseed oil. But it does no harm to the silk as it emulsifies in the boil-out, but used as a sizing for rayon warps, it is absolutely unsuitable.

When rayon weaving started, it was done by silk weavers who used the same size on rayon as on silk and could not get rid of their troubles till they changed the size. Starch, in general use on cotton, proved unsuitable on rayon. It fastens tenaciously to the fine filaments, is hard to remove, and causes breakage of the filaments. Today a glue or gelatine is mostly used for warp-sizing of rayon goods. But gelatine is not a well-defined chemical compound. There are differences between different lots of it. Its chemical properties change with the temperature of application,—one day it may emulsify perfectly, the other day not, though ordinary gelatine is supposed to go into solution without any difficulty in water of 140-160 degrees Fahr.

To assure complete removal the woven rayon pieces are treated today before a boil-out with caustic soda solution of 4 degrees Tw., aired for about 10 minutes, rinsed and after that boiled out with soap and soda ash.

Mordanting and Tin Weighting

There are two more preparatory processes which have to be mentioned here, and which may be the cause of uneven dyeing. These are the mordanting of cotton goods for the following dyeing with basic dyes and the tin weighting of pure silk.

It is natural that cotton goods not evenly mordanted with tannic acid and tartar emetic or with one of the

newer preparations, will never give even dyeings. In the mordanting, the adding of salt, rinsing and hydro-extracting, the dyer has to be as careful as in the dyeing process itself. He has to work slowly, exactly at the prescribed temperature, and give the process the necessary time. Rushing is harmful, as everywhere in the whole dyeing business.

The same goes for tin-weighting. This is a chemical process which deposits in the silk fiber an insoluble tin-salt.

Part II—Practical Control of Dyeing Processes to Assure Correct Shades and Level Dyeings

In the dyeing process it is necessary that the dye liquor penetrates the whole material.

We encounter the troubles of incomplete penetration in the package dyeing, where the inside and outside may get more dye, and dye fuller than the midle of the packages. These will show a light ring in the middle, similar observations apply to dyeing on the beam, also to skein dyeing, hosiery dyeing, etc. If the outside of the goods takes up the dye too fast, before the inside has a chance to get any, we will have uneven dyeing of the lots.

Good Penetration by Mechanical Means

A good penetration, most essential for getting even dyeings is, in the first place, attained by mechanical means. All our different dyeing machines are constructed to assure good penetration, with the least damage to the goods.

Higher speed of the machines, reels, paddles, rotary or skein dyeing machines, stronger pumps on stationary skein dyers, raw stock and package dyers, will give a better penetration. But the heavy mechanical action carries the danger of damaging the goods, especially fine rayons and pure silks. We have to follow here the golden rule and find the happy medium. In skein dyeing for instance a higher speed will give good penetration but poor winding of the yarn. Higher speed of the silk reel will give a good penetration but show chafe marks,—in rayon dyeing broken filaments. The same is the case in dyeing full-fashioned pure silk hosiery.

Retarding and Wetting-Out Agents

To assist penetration the dyer has some chemical means. He has the aid of retarding and wetting-out agents. A retarding agent in the dye bath will prevent dyes from rushing on to the goods. Glauber salt works this way in connection with acid dyes on wool. Sulfonated alcohols retard wool dyeing with direct dyes as with vat colors. The slower the dyes go on, the better the penetration will be.

The use of a wetting-out agent is specially necessary for cotton-processing. Rayon, pure silk, well scoured wool rarely need any; rayon for instance, sinks instantaneously in water, but cotton does not. The fiber contains waxes which resist an ordinary wet-out in plain water. Those wetting-out agents like sulfonated oils, sulfonated alcohols, soap, or any of the others obtainable, lower the surface tension between the cotton fiber and the dye liquor. Ordinary soap is as good a wetting out agent as any of the others; but it has the disadvantage that its frothing sometimes makes light weight goods float and keeps them from the required contact with the dye liquor; thus causing streakiness. The same thing may be observed with sulfonated alcohols.

Selection of Dyestuffs

To keep the dye from rushing too fast on the goods and causing unevenness, it is further necessary to select the most suitable dyes. The dyestuff companies mark their dyes which are best suited for any of the dye processes as level-dyeing. There are special dyes recommended for cotton and wool. Specially selected dyes are recommended for dyeing rayon evenly, even if it should tend to show barrenness.

But it is not always possible to use only the best levelling dyes. Sometimes dyes with special properties, as fastness to light, washing, the property to be after-treated, have to be used. Sometimes price plays a role and cheap dyes which are not so well suited, have to be used. Then the dyer has to follow the next rule very strictly, which goes for any dyeings.

Control of Dyebath Temperature

The dyeing operation must start at a low temperature and this must be increased until the required temperature is reached. The temperature in dyeing plays an important role. The temperature should be the same through the whole bath. This is not always possible. A large dye reel will always show a difference in the temperature in the front and the back, sometimes between both sides. If we raise the temperature slowly, the dye liquor is thoroughly mixed and differences in temperature are reduced to a minimum. Further, we have to keep the dyeing temperature, once it is reached, the same through the whole process. There are mechanical devices which ensure this, besides the attention of the operator.

To keep the right temperature is particularly necessary when working with vat dyes. To follow strictly the formula given by the dyestuff companies is most essential. From my own experience, I confess that I tried many times to work at a higher temperature than that

which was recommended for the process, in order to get better exhaustion of the dye, but never with satisfactory results.

The dyer has to be as careful with after-treatments as with the actual dyeings. Any uneven after-treatment will make the dyeing uneven; after-chroming in dyeing woollens, diazotizing and developing of developed dyes, after-chroming directs and sulfurs, topping of dyeings with basics, dulling of silk and rayon hosiery, and waterproofing are examples. In working with vats a perfect and thorough oxidation has to be achieved. Packages and beams dyed with vats and not thoroughly oxidized will show a ring in the middle and will be spoilt. And as vat dyes never can be stripped again, those uneven dyeings will be good only to be put into black.

When processing rayon goods, which are today generally dyed with direct dyes, the goods should be well extracted and not allowed to lie wet for any length of time. The direct dyes on rayon are not very fast to water, and particularly not the best levelling of them. As water soluble dyes, they show the tendency of migrating in the dyed goods from the wet parts to the dry ones. Wet rayon goods which have been lying for some time, will show almost regularly dark lines in the folds, and will have to go back to the dyehouse.

The finishing process of piece goods is, in general, without any influence on the evenness or unevenness of the dyeings. All finishes are applied to the goods in full width, and go on evenly. Only a mistake of an operator, if he applies the finish to a direct dyeing at too high a temperature and makes the dyes bleed, will spoil a dyeing in the finishing process.

Dyehouse Laboratory

The greatest help for the dyer is a good formula, and only a laboratory can give it to him. If he has to work out his own formulae in the course of his regular work, on full loads, the price paid for the formulae he gets in the end is a high one. In starting without a good formula, the shade will come out too light or too heavy. One thing is as bad as another. If the shade is too light there is the necessity of making greater additions at the optimum dye temperature with the danger of resulting streaky dyeings.

A too heavy shade has to be reduced and every reduction of the shade, if it goes over just a slight alteration, nearly always ends with obtaining unevenly dyed goods. The costly way of stripping a too heavy shade is often the cheapest way.

With a new shade, in order to attain the right shade and a level dyeing, is to start in the right way from the bottom, with the aid of a good dye formula, and this can only be obtained with the aid of a laboratory.

—♦ ♦—

Some "New" Fibers*

A Boom Period in the Production of "New" Fibers Seems to be Again Approaching

WORKS are being erected near Brussels for the manu- of a new textile fabric made from casein. This substance, which has been named Cargan, is totally different from the recently boomed Italian casein fibers or Lanital. The material has a soft handle, like wool, but is quite impermeable, while wool is capable of absorbing some 50% of its weight of water. It can be spun and woven successfully; the price is low, and the percentage of nitrogen that it contains is about 15.4%, which is the same as that of wool. Essentially the product is a casein fiber of high tenacity. One liter of milk yields 40 grams of Cargan.

From Italy come rumors of the imminent appearance on the market of two new artificial fibers, one resembling cotton, the other wool.

"Cise" is also working on the production of fibers extracted from the broom plant. It is hoped that this material will displace all Italy's requirements in cotton, and at a price satisfactory to the consumer.

A patent has been taken out in U. S. A. by Henry C. Forest, of New Jersey, for the manufacture of artificial schappe from cuprammonium silk. By this process fibers similar in dimensions to cotton to wool or to mohair can be produced, and 20,000 filaments can be spun simultaneously.

A "new" vegetable textile fiber which is said to be an ennoblement of a wild plant and which can be grown in this country has been discovered by Mr. G. J. de Fleury, who has perfected methods of cultivation and fiber extraction. The new fiber is called Cotine of Cotine Products Limited, London, W.C.2.

Requiring little attention, the fiber used first on 30 acres will produce enough for 38,000 acres in five years; while the cost of growing it is about 2½d. per lb., half the price of cotton.

Actual protein fibers are reported from Germany, in Carnofil made from offal and Marma produced from leather and waste hides.

"Hofa" fiber is a mixture of viscose and wood fiber spun into a coarse filament as a substitute for jute, hemp, etc.

*Textile Manufacturer.

Combined Power Production and Process Heating in Dyehouses

C. H. S. TUPHOLME

IT is surprising what can be done to economize in overall power and heat costs when an opportunity occurs to overhaul the power plant and to put into operation some of the newer ideas in power and heat production.

For example, an interesting conversion has just been made in a dyehouse whose power plant had become obsolete. Formerly this plant was buying about 500,000 kwh. each year at an average price of about 3c per unit, which corresponds to an electricity bill of over $15,000 per year, and on the other hand the plant was using for process and heating about 10,000 lbs. per hour in winter time and correspondingly less in summer time. The steam pressure required to drive the vacuum pumps was 60 lbs. per sq. in., whereas the pressure for heating and processing is only about 3 lbs. per sq. in.

In the first place, the superintendent considered the installation of a drawoff turbine, i.e. a turbine fitted with a condenser which would be able to cover the total requirements in electrical energy during the whole year, including summer time when the heating steam load is very low, and equal to about 2,500 lbs. per hour.

Had this been done it would have been necessary in summer to pass more steam through the turbine than is required for heating and to expand it to a vacuum of say 28 in. mercury in a condenser. While this solution would have given total independence from the electrical supply company it has certain important draw-backs.

First, it would be necessary to install at least two sets, one serving as a standby.

Second, the cost of the set with condenser would be in the neighborhood of $20,000 against about $12,500 for the back-pressure turbine described hereafter.

Third, the running of a turbine with condensing plant requires incomparably more supervision than that of a back-pressure turbine where the pressure is always above atmosphere.

Also the price per unit generated in a draw-off turbine is decidedly higher than that of a back-pressure turbine.

Finally the following procedure was adopted:

Not to attempt to become completely independent from the electrical supply company, and simply to restrict the program to generating as many units as possible from the expansion of the heating steam which was required, and to take the surplus from the electric supply, which also acts as a standby.

To obtain satisfactory working it was decided that new boilers be installed at a pressure of 275 lbs. per sq. in. with superheat to heat the steam to a total temperature of 640° F. This gave a pressure of 250 lbs. per sq. in. at the steam stop valve with a conservative temperature of 620° F.

To obtain efficient working it is essential that the back-pressure should be as low as possible. While it could easily have been arranged to exhaust steam against a pressure of 60 lbs. per sq. in., with a view to feeding the vacuum pumps at this pressure it was decided to choose the back-pressure at 5 lbs. per sq. in. only, which was sufficient for the heating and process requirements, and either to feed the vacuum pumps direct from the high pressure boilers through a reducing valve or preferably to transform them into electrically driven pumps.

The turbo-set provided for these conditions and with the quantity of 10,000 lbs. per hour of steam it was possible to cover not only present requirements, which are about 325 KVA with a power factor of 0.9, i.e., 292 KW, but it was also possible to have a margin for any future extension of the electrical load, as 400 KW can actually be generated by this turbine.

With this set therefore it is possible to cover practically the whole requirements in electrical energy in winter time, and an appreciable part of the load in summer time when the steam requirements fall to 2,500 lbs. per hours.

The regulation of the set is arranged so as always to make full use of the amount of heating steam required. Should more steam be wanted by the heating range than that required by the turbine to cover the electrical load, a reducing valve is automatically opened to take the excess heating steam required from the boilers (before superheaters).

On the contrary, when in summer time the load is higher than the electrical energy available at the terminals of the turbo-set this excess load is taken from the electrical supply.

The fuel costs of the back-pressure turbo-set are much less than one-fifth of a cent. Assuming that the plant covers only half the requirements in electrical energy with the back-pressure turbine, the saving on 250,000 units per year generated at one-half cent instead of being bought at 3 cents amounts to $6,250.

TECHNICAL NOTES FROM FOREIGN SOURCES

Illumination with the Textile Microscope—its Methods and Possibilities

Jacques Klinger — Monats. f. Seide u. Kunst-Seide 39,196 (1934).—A brief but good summary of old and a few new methods.

Removal of Linseed Oil Finishes upon Artificial Silk Weaves

Dr. Harry Schneider—Monats. f. Seide u. Kunst-Seide 39,376 (1934).—There is little if any trouble encountered in definishing the artificial fibers after their preparation with linseed oil mixtures, in "normal" cases, that is, when the finish is not more than a few weeks old, and if, in the removal of the finish, certain established facts are regarded, and the correct cleansing agent used. If any of the important factors in the whole sequence of operations is disregarded, especially if the finish is left on for more than a few weeks, then trouble is encountered in removing the impregnating material.

Most important of the points to be regarded is the temperature of the definishing bath, in connection with the length of duration of the treatment. It is not advisable to enter the goods into the bath while the latter is hot, since a "burning in" of the finish takes place; a lower entering-temperature always facilitates complete removal. As to the duration of treatment, experience shows that a previous softening of the goods is always of advantage, but many plants are not fitted up for such a pretreatment, in spite of its importance. Weltzien has already pointed out that a mild treatment in a medium high temperature (not boiling), with the use of much soap (up to 20 g. per liter), gives the best results.

There is a considerable number of assistants, recommended for the purpose, among which fat-solvent-soaps are the more numerous; those tested by the author certainly do assist the process. It would appear logical to consider whether a mere mixture of soap and such a solvent might not be as efficacious. The author did not examine such mixtures as contained sodium perborate, soda, ammonia, etc., but, in order to attain uncomplicated, general conclusions, employed baths containing soap and fat-solvents alone. In some cases a series of experiments was carried through, involving the addition of very small amounts of sodium carbonate, but the results were not essentially different from those gained in the simpler cases.

The experiments, therefore, were carried out with true soaps, with or without fat-solvents; soaps containing such solvents already incorporated, and some of the newer detergents (not soaps) combined with fat-solvents. Such detergents, without addition of fat-solvents, were not tested, since it was known that their detergent properties are usually not sufficient for the demands of a successful detergent for linseed oil finishes. Altogether, seventeen different products or combinations were examined, the materials classified as soap-fat-solvents differing from one another not only in the chemical nature of the solvent, but also in the nature of the soap substratum. Particularly with the soap-components, some of the mixtures included also "sulfonated soaps" or "synthetic detergents"; in some such cases, there was no true soap present.—The products tested naturally varied within certain limits among themselves, as to content of this or that equivalent compound. The experiments were carried out serially; (a) with the use of equal weights of each product without further additions, (b) as in (a), plus the addition of 1 g. of soda per liter (c) with the use of quantities of product on an equal cost basis. The latter series should be of most interest to the industry, of course.

The textile material tested was a mixed weave containing a viscose warp finished with linseed oil, and a cotton wool, the goods having been stored for about eight months, and therefore presenting a characteristically serious problem. The pieces cut from the main lot for testing were immersed in the bath at about 80°-90° C., without previous wetting out, and left there for 45 minutes; bath-ratios were in all cases the same. The treatment in no case led to a complete removal of the finish, which was as desired, since the expected difference in activity of the different baths could therefore be appraised. The extent of removal of the oil-finish was then determined by immersing all the samples, after good washing, in a bath containing 0.1 g. of Cellitone Fast Pink B per liter, and treating therein, all together, for 15 minutes at 50°-60° C. Finally, the samples were rinsed twice in cold water, centrifuged, and dried. The samples assumed a color increasing in intensity with the increase in amount of oil-finish remaining upon the fiber, capable of being evaluated easily. The lighter the tint, the less the amount of finish remaining upon the fiber, and the more effective the scouring. Experience soon showed that the method gave good, dependable, comparative results—absolute numerical results were not desired, and probably could not have been attained even if desired.

The method, suited for regenerated cellulose, is obviously not suited for acetate silk. The Cellitone dyestuffs are especially suitable, because of their high degree of dispersion, which makes possible good, even penetration, and ease in washing off merely attached dyestuff afterwards. Oil-soluble dyestuffs are not suitable, since they must first be dissolved in alcohol; when this solution is added to the bath, the dyestuff precipitates out and flocculates, thereby bringing about danger of uneven deposition, which cannot be easily compensated for by rinsing, and confuses or even vitiates the results.

The author sums up his conclusions as follows:—the most effective agent contains a high percentage of a true soap, or consists of a mixture in which a true soap is the foundation. Those agents which consist in part of sul-

fonated oils or fats, or of "synthetic detergents", or which are essentially fat-free in any connection, act more poorly or even badly. In apparent contradiction to these facts stand the products containing methyl-hexaline with a foundation of a true soap; such products are found to be unsatisfactory in their action; one of such products tested proved to exert the least action of any product examined, in any series of experiments. This is a striking fact, as methyl-hexaline is a substance widely employed in practice. In this particular case, since the total content in active substance, soap plus fat-solvent, is not less than with the other products which show good activity, the action of methyl-hexaline must be considered as an only less vigorous, if not actually retardant, agent in removing the linseed oil finish. It must be considered that this solvent was used in conjunction with a soap—therefore the latter must have been the effective agent, as far as any action at all took place.

The "synthetic detergents", which were tested in combination with a commercial fat-solvent, assume an intermediate position in effectiveness. Their value is less than that of a true soap, yet they are certainly more effective than the ordinary sulfonated oils, which do not cleanse at all, and whose use cannot be recommended.

A curious case is afforded by a mixture of a true soap and of perchlor-ethylene. As it was used, it possessed a comparatively low concentration, and was of little effect; the figures show, however, that if, with its low price, a proportionally larger amount be used, so as to bring the cost up to that of the amount of the others used, it is to be classed as an effective agent.

The fat-solvents evidently play an insignificant part in the process; it appears to be the soap which effects the results obtained. Yet the use of good fat-solvents in mixture with soaps is to be recommended.

One table and three photomicrographs are given.

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Physicochemical Methods for Determination of Wool Damage

A. Itkina u. Plechan—Mell. Textil-Ber. 16, 45 (1935).—The first part of a paper, to be continued.

The chief means of determining whether wool has been damaged by treatments, or by general carelessness in its handling, has been the dynamometrical method—the determination of its breaking-point under tension, which does not give very exact results, due to the presence of moisture, non-uniformity of samples, etc. The authors have laid down a series of chemical tests in the present paper; the tests depend upon the different behavior of damaged and of undamaged wool toward certain reagents. They do not claim their results to be, as yet, exact and exhaustive, since they have not yet proceeded to establish limits of sensitivity. They have first reviewed the already known chemical tests proposed by previous workers, and have compared the results in respect to sensitivity among themselves; and have also devised some new tests.

The methods employed so far as especially suitable come under the following headings:—

1—Colorimetric methods for determining the diazo-reaction upon woolen hairs.
2—Adsorption of different dyestuffs.
3—The Allwoerden reaction, with characteristic quantitativation of damage.
4—Degree of swelling of the woolen fiber.
5—Determination of amino-nitrogen.
6—Solubility number (loss of weight).

Of these, the first topic is taken up fully and carefully in this section of the paper. It was proposed by Pauli for undyed wool-hairs. The authors have modified Pauli's method somewhat, and have made it applicable to dyed fibers as well, after the dyestuff has been stripped. This method consists in the formation of a colored compound through the diazo-reaction, and colorimetric determination of the solution produced.

The details are of great interest, and deserve quoting in full: 0.2 g. of the wool sample (fiber or weave) are wetted in a vessel with 30 cc. of a 9 per cent sodium carbonate solution. Then 0.2 g. of a diazotate (e.g., Fast Scarlet Salt R) are rubbed up with a few drops of warm water to a paste, dissolved in 5 cc. of cold water, poured into the beaker containing the wool and bicarbonate (? carbonate was previously mentioned), and the whole stirred for ten minutes; the wool then removed, carefully washed with cold water, and placed in a 50 cc. volumetric flask containing 10 cc. of a 1 per cent NaOH solution. The flask is then placed in boiling water and heated until the wool has entirely dissolved, then cooled to room temperature, filled with water to the graduation, the liquid well mixed, and "colorimetered."

The normal solution was prepared thus: 0.008 g. of tyrosine was dissolved in 5 cc. of a 9 per cent NaOH solution, treated with a similar portion of the same diazotate solution prepared as above, filled up to the 25 cc. mark, and during 5 minutes warmed in a water-bath to 85° C., the pale canary-yellow color passing over to an orange-brown. The concentration of this normal solution was 0.0612 per cent.

The determination of the extent of damage to the wool sample under investigation was carried out as follows: after solution of the specified amount of a practically undamaged sample of wool in caustic soda, and after the addition of the same weight of diazotate to the solution, as specified above, the authors assumed that the concentration of the colored solution obtained represented a 100 per cent damage to the wool fiber (this is one assumption, at least, that the most carping critic could hardly fall foul of). The percentage of the extent of damage was calculated according to the date of the colorimeter.

hm = height of column of liquid in standard tube.
hx = height of column of liquid in sample tube.
Cm = concentration of standard solution.
Cx = concentration of sample solution.

$$Cx = \frac{hm.\ Cm}{hx}$$

A = a concentration of solution corresponding to a 100 per cent damage.

Ax = extent of damage of the sample, expressed in per cent.

$$Ax = \frac{Cx. 100}{A} \text{ (in per cent).}$$

According to concordant results, the authors obtained for certain samples the following definite figures:

	Extent of Damage
1—Undamaged, dyed	11.2%
2—Damaged by 0.025 per cent K_2CO_3..	14.05%
3—Damaged by 0.1 per cent H_2SO_4 sol.	15.6%
4—Damaged by boiling in water.....	12.2%
5—Damaged by carbonizing	13.2%
6—Damaged by insolation, 3.5 months.	33.9%

As to the second topic, that of the adsorptive characteristics of dyestuffs, the authors remark, that the fact that damaged wool-fibers take up more dyestuff than do undamaged ones, is of course not new. According to statements in the literature, Benzopurpurine 10B and Methylene Blue are chiefly used as tests; the extent of damage to the fiber is estimated from the intensity of the color of the sample, or of the suspected part of it; and of course only great differences in quality can thus be detected. The authors attacked the problem from another angle; after determination of the conditions of maximum adsorption of the dyestuff by the wool, and the concentration of dyestuff corresponding to these conditions, they determined the amount of dyestuff remaining in solution, and in this way obtained a characteristic of the extent of the damage which the sample had suffered. An inversely dependent relationship was thus ascertained; the more dyestuff remaining in solution, the less the extent of the damage to the wool. The method of working was as follows: an exactly weighed amount, 0.1 g., of wool fiber or weave was wetted with 50 cc. of water, and after 15 minutes treated with 9 cc. of dyestuff solution (5 g. per liter). This amount corresponds to 45 per cent of the weight of the sample. In one-half hour after the bath began to boil, 0.5 cc. of 0.5 per cent sulfuric acid was added, then after 15 minutes the same amount again (total, 5 per cent of the weight of the sample). This was carried out in an Erlenmeyer flask with reflux condenser. The sample was then withdrawn, washed (washings added to the bath), the bath brought to a definite volume, and compared colorimetrically with a standard solution of the dyestuff. In dyeing with Benzopurpurine 10B, with addition of acid, it was found that, in the case of undamaged wool, the solution assumed a blue color, which was not the case with damaged wool. In order to correct this situation for examination in the colorimeter, the blue solutions were treated with a few drops of caustic soda solution, which of course restored the red color.

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Determination of Small Quantities of Copper in Textile Fibers and Weaves

G. Durst—Mell. Textil-Ber. 15, 568 (1934).—In a previous paper in "Melliand's" (Vol. 15, p. 315), the author spoke of a method for the determination of small amounts of copper in textile goods, which related to a more exact control of the tendency, in the colorimetric method with ammonia, toward too high figures. He has since worked over the entire subject again.

A method has been published, now well known (Ind. Eng. Chem. 3, 314, 1931), consisting in the use of nitroso-chromotrope acid (the disodium salt of it). This gives with copper ions, in weakly ammoniacal solution, a blue-red color, which with a slight excess of the nitroso salt (a deep orange-brown solution) passes over into a more yellow-red tone. The reaction involves the union of one Cu with 2 mols of the nitroso compound. The sensitivity of the method is stated to be 0.5 gammas of Cu.

As the method, up to the present, passes as an exact method, it seems well to repeat here the details, in view of the unsatisfactory results it has given in the author's hands.—0.37 g. of the nitroso-chromotrope salt is dissolved in a little water, 1 cc. of 2/N soda solution added, then 0.5-0.6 cc. of 2N sodium nitrite solution added, and a slight excess of dilute acetic acid. After standing 24 hours, the solution is filtered, made weakly alkaline with sodium carbonate solution, and diluted to 100 cc. Of this, 34 cc. are mixed with 50 cc. of alcohol, and the mixture diluted to one liter. One cc. of this standard corresponds to 10 gammas of copper. To check its titer, a solution of copper sulfate, of 2.5 g. of crystallized $CuSO_4$ in 250 cc. of water, is prepared (electrolytically checked, 25 cc. of this solution contained 0.0614 g. Cu) and 10 cc. of it are diluted to 250 cc. One cc. of this diluted solution contains 49.1 gammas of Cu. One cc. of it is treated with three drops of conc. ammonia-water, and titrated with the standard nitroso-solution in a test tube. (The original paper recommends that the resultant color be checked by concurrent observation of standard solutions.)

The author finds the determination of the endpoint in this method to be difficult. A bluish red alters only to a yellowish red; and one who has done any color-matching knows that such a mere tonal change is not by any means decisive. The author's tests showed that 1 cc. of the copper solution required 5.24 ccs. of the nitroso-solution, before any possible alteration in tone was perceptible and that 5.53 ccs. had to be added (as a total) before the change was decisive. It appeared advantageous to dilute the mixture with 5-10 ccs. of water. The author believes that, for larger amounts of copper than those tested, the above procedure is by no means to be recommended, as the bluish-red liquid becomes greater and greater in volume as the nitroso-solution is run in, and with the increasing volume a drop in excess of the orange nitroso-solution can bring about only a progressively less noticeable change in color. For one who has become used to the method, and possesses in addition a good color-perceptiveness, the method may be useful for small amounts of copper, below 50 gammas.

The author proceeded to test a second titrimetric method,

that of iodimetric micro-titration, which appeared to be promising. The standard solution was a 1/1000 N solution of thiosulfate. The first trials showed that the method, as it was, was valueless, because of the even worse variations in result encountered, variations evidently caused by variations in the dilution of the copper solution, and the rate at which the titration was carried out. Further experiment showed that it was the insufficient amount of potassium iodide present which led to the variations in results. This factor mastered, it proved a simple matter to obtain results which checked, independently of the dilution of the thiosulfate, etc.

The modification worked out is as follows:—10 g. of the goods, which according to preliminary tests contained over 0.005 per cent of copper, were ashed, and fumed down twice with nitro-sulfuric acid. The residue was taken up with one cc. of 1/1 dilute sulfuric acid, and rinsed into a shaking-flask of 50 cc. content, with a total of 15 ccs. of water; 1.5 g. of cryst. sodium acetate was added to neutralize the sulfuric acid, then 5 ccs. of a 10 per cent potassium iodide solution, and a drop of starch solution as indicator. The solution was titrated with a freshly prepared solution, 1/200 N, of sodium thiosulfate from a micro-burette of 5 ccs. content, graduated to 1/100 ccs., until the blue color had completely disappeared. The color-change took place decisively, with a single drop of the thiosulfate solution, which corresponds to an error of 0.05 ccs. in a total used of about 2 ccs. The thiosulfate solution was prepared by dilution of 1/10 N. thiosulfate to 200 ccs. The water used for dilution must be well boiled out previously, and even then the permanence of the solution is only slight. The author prepared it fresh twice a day.

The method, standards, etc., were all checked repeatedly, and the results were uniformly concordant.

Micro-chemical Test for Ammonia with Oleic Acid

Dr. A. Herzog—Mell. Textil-Ber. 16, 52 (1935)—An interesting short article, finely illustrated, with five brilliant photomicrographs of the formation of ammonium oleate crystals in characteristic determinative aspects. The test is carried out most simply by allowing the fluid suspected to contain ammonia to run in and mix with a droplet of oleic acid under the cover-glass upon the slide. The test is equally sensitive with ammoniacal liquids, gaseous ammonia, or ammonium salts, if the solutions of the latter are treated with a drop of dilute caustic previous to the reaction with the oleic acid. The author suggests that the test be carried out by employing a ring-slide with a ring 1-2 mm. in height, cemented upon the slide; placing the liquid to be tested for ammonia upon the slide within the ring, and laying the coverglass, with a tiny drop of oleic acid on its center, on the underside, upon the ring, and observing the course of reaction in the droplet. The slide should not be warmed, to hasten the evolution of ammonia. The first stage of reaction is the formation of a characteristic myeline mottling, unmistakable after being once observed with a known sample. The sensitivity of the test lies around 0.000001 g. of ammonia.

The author recommends a special chambered slide of Zeiss, in which the ring is fused to the slide, thus preventing trouble from accidental contact of caustic solution with the cement with which a separate ring would be attached to an ordinary slide. By the use of this slide, a microchemical quantitative determination of ammonia, through the formation of ammonium chloroplatinate, is possible, the reagent in this case being a drop of 10 per cent platinic chloride solution.

Relations Involved in Mixing of Dyestuffs in Practical Dyeing

W. Schramek—Monats. f. Textil-Ind. 50, 14 (1935).—The work here cited is really a discussion of the problems and methods involved in dyeing according to the Ostwald color-system, and in the preparation of a color-chart of swatches classified according to Ostwald's method, as standards, upon the different types of fiber. The author remarks, by way of introduction, that, whether or not the Ostwald system is correct, no one has as yet succeeded in devising a better one; but that the preparation of the standards, so that one plant, having prepared its own set, can truly claim to place its results in parallel with those of another plant and its standards, the standards having been dyed according to what is so far believed to be a uniform method, is a problem not yet worked out. He offers some considerations as to the methods which must be employed in the working out of the problem.

The paper does not permit of being abstracted, being of a closely reasoned, detailed nature. It is recommended for study (careful study) by those interested.

One graph is given.

The second part of the paper (l.c. p. 61) takes up various findings from spectral studies. Eight graphs and a diagram are given, dealing with typical cases of certain Indanthrene dyestuffs, alone and in mixture.

The third section of the paper, the concluding part, gives four graphs, one diagram, and thirteen tables, relating to specimen mixtures of pairs of dyestuffs, for prescribed results in dyeing.

The whole paper selects Indanthrene dyestuffs as examples, though the principles deduced are equally applicable to other groups, when the necessary constants have been worked out.

Relation Between the Dyeing Process, Brightening or Souring, and Friction

Prof. Horst Russina-Monats.f.Textil-Ind. 50, 17 (1935) In the finishing of cotton, as well as in the manufacture or working up of viscose, the brightening or souring of the product is an important item. The process (for which in English there seems to be no one term which implies just what the French and German term "Avivage" signifies) produces not only greater flexibility and better feel of the

goods, but contributes to much greater convenience in later processing.

For example, in dyeing viscose with the Indanthrene colors, we can observe that the quality of the viscose silk is considerably altered, evidently as a result of the special dyeing process employed. The fiber appears harder, more strawlike, and less flexible; and these qualities appear in a more drastic form in yarn-dyeing, in which case it is often observed that the skeins dyed by the vat process cannot any longer be satisfactorily rinsed. It is in particular reference to the latter result, that it has become rather customary to give the goods a subsequent souring. It is held, in some quarters, that such aftertreatment makes the usual difficulties in later processing more rare in occurrence and less vexing in nature.

Consideration of the reasons for such alteration in physical characteristics of the fiber, in the case of Indanthrene dyeings, would suggest the following possibilities. The caustic of the vat will have some action upon the finishing agent present in the viscose silk (in this case, the "Avivage" would be a "mere" finishing agent). Whether the soaplike substance in the finish of the viscose silk is dissolved out by the caustic of the vat to too great an extent, or whether the fatty acids and fats are dissolved out in the form of a soap, must be considered, as well as the possibility of still other processes taking place. The caustic, at all events, certainly brings something about; and so the properties imparted by the finishing of the viscose before dyeing are nullified.

A direct action upon the fiber itself may also be considered as at least possible. The viscose fiber, even in rather dilute caustic solutions, does undergo a certain amount of swelling. In a final souring, a shrinking, resulting in a kind of crumpling of the surface, takes place. This irregular shrinking must be able to influence the structure, as well as the surface-characteristics, of the fiber. This alteration in the surface-characteristics of the fiber must have a considerable relation to the conditions met with in the further processing of the fiber, as well as having its influence upon the static properties of flexibility and softness of feel. The new surface-characteristics will find their expression particularly in the matter of friction-phenomena; and alteration of the functional characteristics will decide whether the subsequent processing will encounter more, or less, difficulty.

Dr. A. Weltzien has recently called attention to this interrelationship, pointing out the logical conclusion that the real value of a finish is determined by its ability to reduce friction in processing (as apart from luster, feel, flexibility, etc.) He measured the degree of frictional resistance of various samples of fiber by drawing the fiber, under different mensurable tensions, over a glass rod, whose value might be supposed to be nil as far as frictional resistance went. The friction encountered by the passage of the fiber over the smooth glass surface resulted in the production of a state of tension in the fiber, and this was determinable by the tensimeter.

In accordance with this hint, the author has carried out some work upon material which had been dyed with Indanthrene dyestuffs, and variously finished before, and after dyeing. The apparatus used was not that employed by Weltzien, but the Franzel-Hahn apparatus, now so often mentioned in textile literature. This apparatus measures the tension set up in a fiber at definitely established degrees of stretching, and records it continuously. It proved a simple matter to adapt the apparatus for the purpose here dealt with.

Normally, the fiber is drawn through two pairs of control-rollers, which impart to the fiber, according to the adjustment of the gears of the rollers, a definite tension, and therefore a definite stretch. Between the two sets of rolls, the fiber is led over the device which measures the tensile force being exerted. For the author's purpose, the first pair of rollers was uncoupled, and the fiber led instead over a glass rod. The stretch, and the corresponding force necessary to produce it, determined with what frictional resistance the fiber was passing over the glass rod, or, better expressed, what functional resistance the fiber possessed in reference to the smooth glass surface.

A diagrammatic sketch of the apparatus is given, also a table of graphs illustrating some of the results. Further study of the question is planned.

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Technique of Stripping Woolen Rags

"R."—TIBA 12,434 (1934)—A very detailed account of methods which work well, covering a great deal of ground, and concisely written. Exact procedures are given for various alkaline methods, and for oxidative methods, as with dilute nitric acid, nitric and chromic acids, chromic acid alone, chromic and oxalic acids, and potassium permanganate.

(l.c. p. 499)—The closing section of the paper deals with the reductive processes, employing notably the hydrosulfite-formaldehyde-zinc compounds, ordinary hydrosulfite, and hydrosulfite-sulfoxylate. A brief section at the close of the paper deals with such violent reducing agents as stannous chloride and titanous chloride in the presence of hydrochloric acid; which proved impracticable, on the grounds of poorer effect, greater expense, and corrosion of the most resistant metal bowls.

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Influence of Acidity and Alkalinity Upon Woolen Fibers

"M. D."—TIBA 12, 439 (1934).—A paper of scientific nature, naturally giving much attention to physico-chemical questions.

It deals successively with the topics of the chemical composition of wool and the keratine question, the iso-electric point of keratine (the author's determination of the iso-electric point by the electrophoretic method gives a value of about 4.6, which he considers more probable than Harris' value of 3.4, determined by the pH method), the effect of water upon keratine, and the effect of acids upon wool. The paper is to be continued.

NEW PRODUCTS—TRADE NOTES

• NEW ENGLAND OFFICE

A New England office, staffed for consulting and sales engineering service to those having problems of instrumentation in manufacturing processes, laboratories, power plants or educational institutions, has been opened recently in Boston by Leeds & Northrup Company. Their complete line of measuring, recording and controlling instruments, as well as their electric heat-treating furnaces, will be handled through this office. The address is 422 Chamber of Commerce Building, 80 Federal Street, Boston, Mass.

• "CAVALCADE OF AMERICA"

Du Pont resumed its "Cavalcade of America" dramatizations of episodes from the pageant of America's growth and development Wednesday, September 30, from 8:00 to 8:30 P.M., E.S.T, over the nationwide Columbia network. During the summer months, the same sponsor has presented, in this weekly period, a series of musical programs, featuring first Arthur Pryor's Band and then Don Voorhees' Orchestra in programs tracing the origin and development of various types of music in America.

The fall and winter programs will present, in the same manner as the "Cavalcade" programs of the past year, which won widespread commendation from civic and educational leaders as well as the general public, authentic incidents and episodes in American life, stressing little-known human-interest dramas.

Du Pont will continue also to focus attention, in the "Cavalcade" programs, on the achievements of the research chemists and their contributions to modern life, with "Better Things for Better Living, Through Chemistry", as the theme.

Dr. Dixon Ryan Fox, President of Union College, and Dr. Arthur M. Schlesinger, professor of history at Harvard University, will continue as historical consultant for "The Cavalcade of America", checking all scripts to assure historical accuracy. The programs are produced under the direction of Arthur Pryor, Jr., with Kenneth Webb as scriptist.

In order to provide a later broadcast period for west coast and Rocky Mountain listeners, "Cavalcade" will inaugurate a rebroadcast schedule on October 15. Although the eastern broadcasts will continue at 8:00 P. M., E.S.T., Wednesdays, the rebroadcasts will be made at 11:30 P. M., E.S.T., Thursdays, taking the program to the Pacific Standard zone at 8:30 P.M., the Mountain Standard zone at 9:30 P.M.

• GERMAN DYE INDUSTRY

The German dyestuffs industry has been operating at a rapidly increasing rate during the past two years and while official statistics are not available it is well known that the current output is far above that of depression years and may be in excess of pre-depression records, according to reports received by the Commerce Department's Chemical Division from the American Consul at Frankfort-on-Main.

Estimates believed to be reliable placed the German dye output at approximately 76,000 metric tons in 1934 compared with 66,000 tons during the preceding year and 75,000 tons in 1929. From all indications further production gains were made in 1935, it was stated.

Germany's export trade in dyestuffs during the first half of the current year registered both volume and value gains over the first six months of 1935, but the value received was somewhat lower than the return for the corresponding months of 1934—the loss being due to lower prices and heavier shipments of low priced dyes to Oriental markets, the report states.

Export shipments of dyestuffs from Germany during the first half of 1936 aggregated 18,785 metric tons, valued at 68,478,000 marks (approximately $27,391,000) compared with 17,446 tons, valued at 62,031,000 marks ($24,812,000) in the corresponding period last year and 17,597 tons, valued at 73,147,000 marks ($29,260,000) in the first six months of 1934, official statistics show.

By volume Germany's leading export markets for aniline and sulfur dyes during the 1936 period were China which took 2,837 metric tons; British India, 1,941 tons; Great Britain, 810 tons; Czechoslovakia, 802 tons; Belgium, 552 tons; Sweden, 550 tons; the Netherlands, 521 tons; Hungary, 444 tons; and Austria, 412 tons. The balance of this class which makes up approximately 80 per cent of Germany's total dye exports were very widely distributed to world markets, 250 tons, valued at 2,179,000 marks ($871,600) coming to the United States.

The heavy gain in Germany's shipments of indigo dyes from 2,113 metric tons in the first half of 1935 to 2,452 tons during the 1936 period was due largely to increased shipments to China. British India, Egypt, Iran, Spain, Hungary and Mexico also took more of these dyes in 1936, but losses were recorded in shipments to Netherland India, and the United States, according to the report.

Great Britain, Czechoslovakia, the United States and Canada and Japan were largely responsible for the increase in exports of alizarine dyes, more than offsetting losses in shipments to British India, Italy, Belgium, France, Switzerland, Brazil, and other less important markets for this class of dyes.

British India accounted for a relatively heavy expansion in Germany's exports of alizarine red dyes, the report states.

• BROWN CATALOG

The Brown Instrument Company has just published a new catalog on Brown Air Operated Controllers for the control of temperature, pressure, flow and liquid level.

This new catalog (No. 8901) covers the complete line of Brown Air Operated Controllers. It explains in simple non-technical language the principle of operation of Brown Air Operated Controllers and contains, as well, many helpful diagrams, illustrating their simplified construction, the ease with which control units may be interchanged and the ease of "tuning in" for "Throttling Range and Automatic Reset". Catalog No. 8901 also contains complete descriptions of Brown features: universal cases and their drilling dimensions; Brown Air-o-Motor Valves; Valve Positioners; Air-o-Motor; and the Brown Powder Cylinder.

A copy of this catalog will be sent promptly to any one interested in Air Operated Controllers.

• DU PONT RELEASES

The Dyestuffs Division of the du Pont Company has recently placed on the market the following new products:

"Acetamine" Yellow 5G (Patented)—which produces bright, greenish shades of yellow on all types of acetate fiber yarns and piece-goods. It is said to exhaust readily and build up well in the dyebath so that it is an economical color to apply. Furthermore, "Acetamine" Yellow 5G is said to exhibit very good fastness to dry cleaning, steaming and sea salt and to show good resistance to perspiration and cold water. It is also said to discharge to a pure white and to be of interest for bright, greenish yellows and bright yellow greens both in solid shades and as a base for discharge patterns.

"Merpol" B (Patented) and "Merpol" C (Patented)—two new auxiliary products for use in the textile industry. The former is said to be of particular interest as a detergent or cleansing agent with good emulsifying properties, and the latter as an effective penetrant with unusually good solvent properties. "Merpol" B is particularly recommended by the manu-

facturers for kier-boiling or in boil-off operations, as a dyeing assistant in circulating type machines and as a penetrant for dyeing hard twisted wool carpet yarns. It is also said to readily remove and emulsify the lubricants used in the processing of acetate fabrics. "Merpol" C is said to possess exceptionally strong wetting, penetrating, leveling, dispersing and homogenizing properties, and to be valuable for wetting-out, boil-off operations, kier-boiling and as a dyeing assistant in the application of all types of dyestuffs. When used for these operations, "Merpol" C is said to show a combined emulsifying and solvent action. Moreover, it is said to assist in producing bright, clean dyeings of the "Naphthanil" type of colors when used in the prepare bath.

"Acetamine" and "Naphthanil" are registered trade-marks of E. I. du Pont de Nemours & Company, Inc.

● JOINS CAROLINA A & E CO.

T. J. Marler, formerly connected with the Manufacturer's Soap and Chemical Co. of Tennessee as plant superintendent and salesman, has joined the sales organization of the Carolina Aniline & Extract Co., Inc. He will cover Tennessee and northern Georgia and Alabama in which territory he has a number of friends.

● NATIONAL RELEASE

National Aniline & Chemical Co., Inc. announces release of the following bulletin:

National Milling Navy Blue 4 *B*—a neutral or weakly acid dyeing navy blue said to be of excellent fastness to sea water, washing, carbonizing, perspiration and rubbing, very good fastness to fulling and alkali spotting, and fair fastness to sunlight. It is further said to be suitable for the dyeing of wool, pure and tin-weighted silk, to give clear hydrosulfite discharge on all fibers, and to have better than average retention of shade in a boiling bath. It is recommended by the manufacturers for the dyeing of slubbing, knitting yarns for bathing suits and sweaters, yarns for embroideries and fancy threads, and for hosiery. Acetate effects are said to be slightly stained in a neutral bath but to be left clear in an acid bath. Bulletin No. 206.

● GENERAL RELEASES

General Dyestuff Corp. announces release of the following circulars:

Hydron Blue G A Paste and *Hydron Blue R A Paste*—two dyestuffs said to be especially suited for the production of navy blue shades on piece goods. Both dyes are best dyed with caustic soda and hydrosulfite. The dyeings are said to possess good fastness to light, excellent fastness to washing and moderate fastness to chlorine. It is stated that they are easily soluble and dye very level. Circular G-153.

Eulan—Independent Testimonials — a pamphlet consisting of testimonials by scientists and mill men concerning the excellent and durable results obtained in mothproofing with the different Eulan brands on all kinds of woolen material.

● BRITISH DYESTUFFS OUTPUT

The British dyestuffs industry continues to make rapid progress, with both domestic and foreign demand during the first seven months of the current year running at levels never before attained, according to reports received by the Commerce Department's Chemical Division from the American Consulate in London.

Those closely connected with the industry confidently believe that production during 1936 will exceed 60,000,000 pounds which would be an all-time record, the report states. Such a figure, should it be attained, would be more than six-and-one-half times the pre-war output, and two-and-one-half times the amount manufactured in 1920, during which year the industry wars placed on the protected list (Dyestuff Import Regulation Act of 1920).

During the first seven months of the current year Britain's dye exports aggregated £917,765 in value, which compares with £861,075 and £747,546, respectively, for the corresponding periods of 1935 and 1934, according to British Board of Trade returns.

Improvement throughout the British dye industry is attributable in large measure to heavier demand for domestic textile trades, the report points out. Reports from Lancashire, Yorkshire, and Scotland indicate that conditions in the bleaching, dyeing, finishing and calico printing sections compare favorably with those existing at this time last year, and that prospects for the autumn may be considered more saisfactory than for some time.

● HERCULES EXECUTIVE IN EUROPE

Arthur Langmeier, Director of Sales of the Naval Stores Department of Hercules Powder Company, sailed on the Holland America steamer "Veendam", Saturday, September 19, to visit N. V. Hercules Powder Company, The Hague, Holland. Mr. Langmeier will also visit other distributors of Hercules Naval Stores products in England and continental Europe.

● CALCO RELEASE

A very complete booklet on *Sulfur Dioxide*—its properties and uses—has just been released by the Calco Chemical Co., Inc.

The use of sulfur dioxide in various industries such as leather tanning, oil refining, paper, textiles, refrigeration and air conditioning is described and typical methods of handling are illustrated. Tables giving the physical properties of both the liquid and vapor are included.

● MOVE TO LARGER QUARTERS

Effective October 1st the offices of Electro Bleaching Gas Company and its affiliate, Niagara Alkali Company, were located in new and more spacious quarters on the 30th floor of the Lincoln Building, East 42nd Street, New York, N. Y.

Increased business, resulting in the need for larger and better office facilities, are said to be responsible for this move. Both EBG and Niagara are known for pioneering activities in their respective fields. EBG was the first American producer of liquid chlorine. The Niagara Alkali Company was the first to produce caustic potash and recently carbonate of potash in this country. These activities are said to have brought a steady increase in the volume of the company's business.

CLASSIFIED

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

WANTED: Thoroughly experienced dyer or finisher of heavy weight cottons for the clothing trade or capable of handling both lines. Age from thirty to forty-five and willing to work. Write Box No. 928, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

WANTED: Old established manufacturer of textile oils and chemicals wants a salesman for the Southern territory. An excellent opportunity is open to the right man. Only those with selling experience in Southern states and knowledge of practical application of products need apply. Write Box No. 926, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

WANTED: New type Smith drum skein dyeing machine. Address Box No. 929, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.